# Pit and Quarry

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## CEMENT-MILL & QUARRY

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Vol. XIX | NOVEMBER 6, 1929 | No. 3



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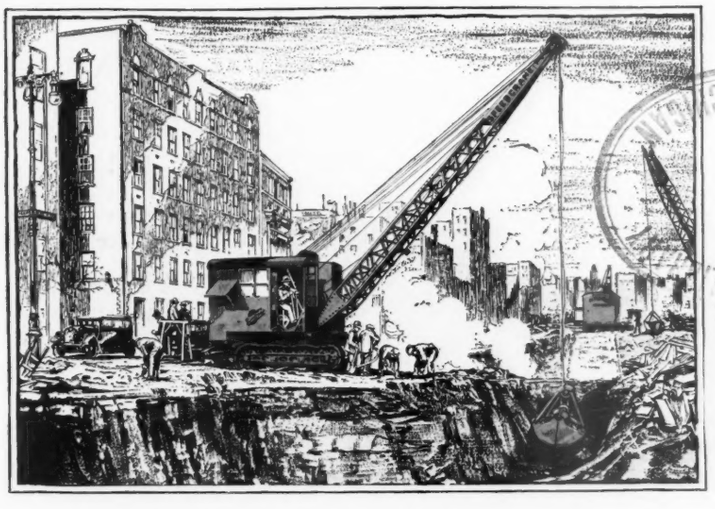

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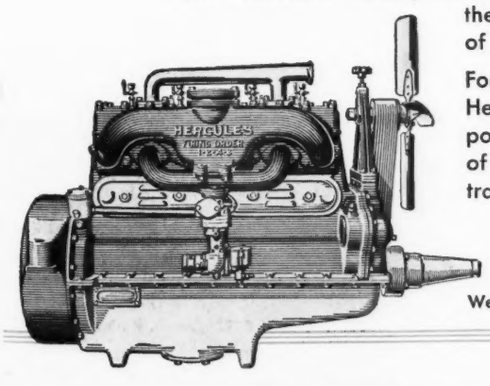


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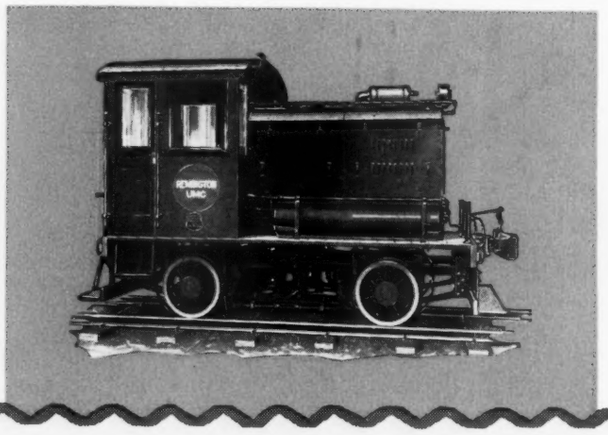

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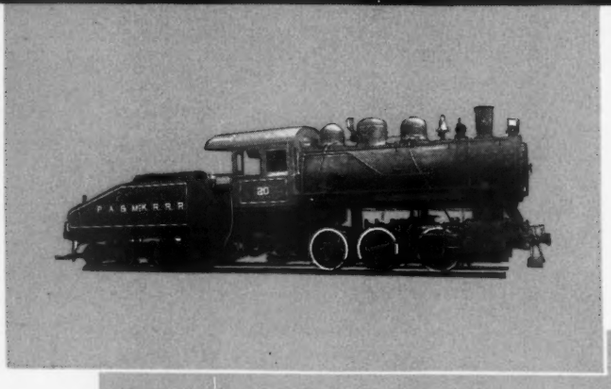

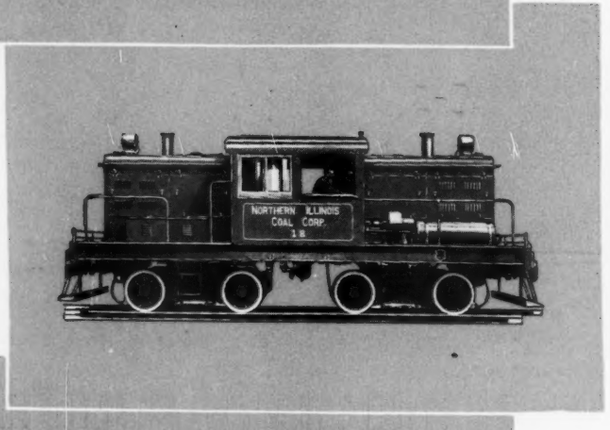


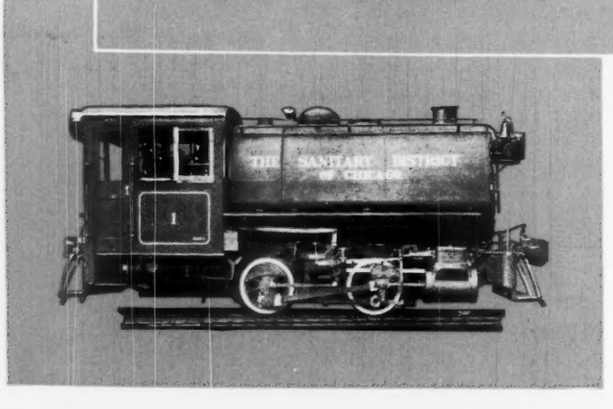


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# Pit and Quarry

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*Next Issue November 20, 1929*

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# Canada Gypsum and Alabastine, Ltd., Operates Large Lime Plant in Quebec

## Although One of Oldest Operations in Canada Constant Improvements Keep it Modern

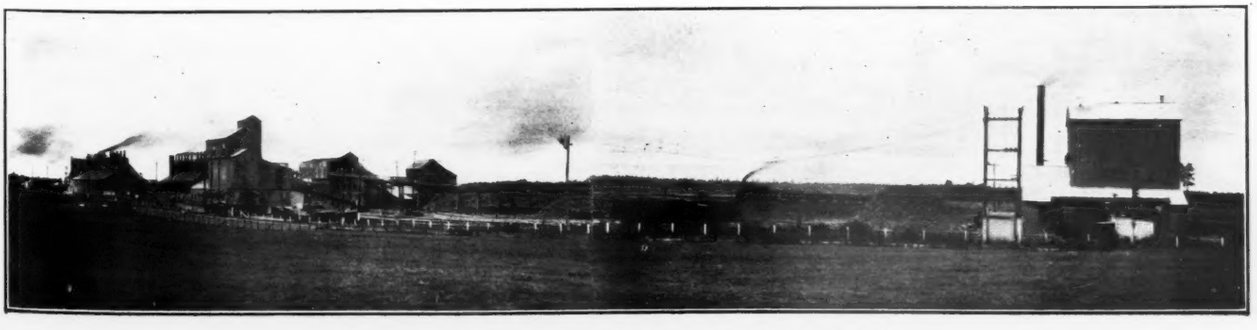
By W. E. TRAUFFER

THE plant of the Standard Lime Company at Joliette, Quebec, Canada, has the distinction of being the largest lime plant in Canada as well as one of the oldest now in operation. The buildings and equipment, however, are of the latest and most modern type, a competent engineering staff being maintained for this purpose. The property of 250 acres on which the plant is located is 1½ miles northeast of the city of Joliette which itself is about 35 miles northeast of Montreal. It is on the Canadian National railway with access to the Canadian Pacific railway. Operations are carried on 24 hours per day in the summer and 10 hours in winter. The daily capacity of the plant is 225 tons of lump lime, 40 tons of hydrated and chemical lime and 1,500 tons of crushed stone. Shipments are made to points as far east as New Brunswick and Nova Scotia, north to the Abatibi paper mill district, west to Ontario and south to the border. This company is a subsidiary of Canada Gypsum and Alabastine, Inc., whose gypsum plant at Caledonia, Ontario, was described in the September 11, 1929, issue of PIT AND QUARRY.

Operations were begun in 1904 by E. E. Lepine who is now managing director of the company.

**Locomotives hauling rock to incline from quarry**

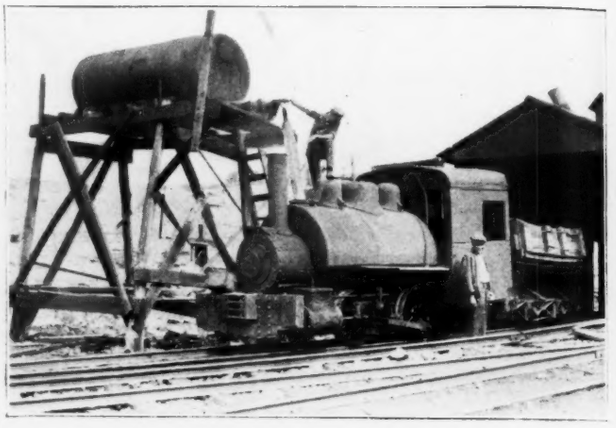
The original plant consisted of two Steacy & Schmidt masonry base and steel jacketed kilns which are in operation today. More kilns were added gradually until ten were in operation in the same building, three of these also being Steacy & Schmidt kilns. In 1919, ten more kilns were erected in another building adjoining the first. The



**Panoramic view of Standard Lime Co. plant at Joliette**

Moving steam shovel in quarry

five newer kilns in the old building and the ten in the new unit were designed by the company's engineers and have concrete bases with steel jackets. The kilns are all 6 ft. in interior diameter and 40 ft. high above the firing floor. The five oldest kilns are 14 ft. in exterior diameter and the fifteen newest ones 11 ft. The other plant buildings also are very modern, having been rebuilt from time to time and new machinery installed to keep up with the best practice. All of the buildings have concrete foundations and floors and corrugated metal siding. The new secondary



Watering one of the locomotives at the quarry

crusher and kiln buildings have steel framework, and the others wood.

## Quarry Operations

The original quarry near the plant was abandoned in 1907 and the present quarry was started about one-half mile northeast of the plant. The deposit is a high calcium limestone underlying the entire property and is hard enough to be used for concrete stone. The stratum is almost level with no faults or fissures from upheavals and its depth is unknown. A 1,000-ft. well at Assomption, 18 miles southwest, failed to penetrate or to reach water. Numerous fossils are found near the top of the deposit and, when stripped, deep grooves as long as 45 ft. are found on the surface. These always run in a southerly direction and, at the south end, a large boulder is always found which made the groove as it was dragged along by the

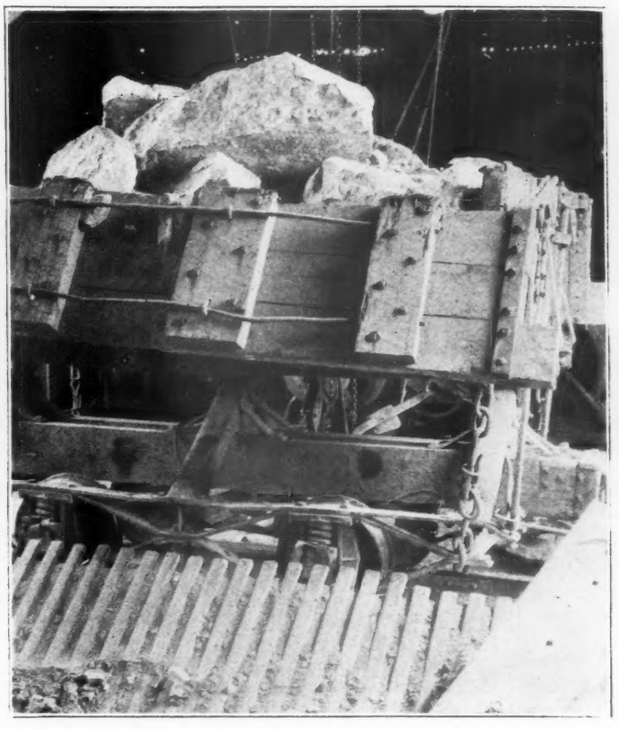
Hauling quarry cars loaded with hydrate stone up the incline. Shovels in background

Loading cars by electric shovel. Steam shovel on rim of quarry. Steam locomotive moving cars

glaciers which once covered the country. A 150 ft. hole drilled in the present quarry floor by a Longyear core drill showed no change in the composition of the stone.

The quarry is now about 1,000 ft. long by 600 ft. wide and has a face averaging 45 ft. in height. The overburden which averages 5 ft. in thickness is removed by a Marion 60 railway type steam shovel with a 2½-cu. yd. dipper and a Bucyrus ⅞-cu. yd. steam shovel. These load into cars which are hauled to the east side of the quarry and dumped.

Blast holes are drilled by two Sanderson Cyclone well-drills and Polar Forcite 30 per cent gelatine dynamite is used. The stone is loaded by a Thew No. 3, 1¼-cu. yd. electric shovel and a Marion 60 traction type steam shovel with a 2-cu. yd. dipper. Ingersoll-Rand jackhamers are used for secondary

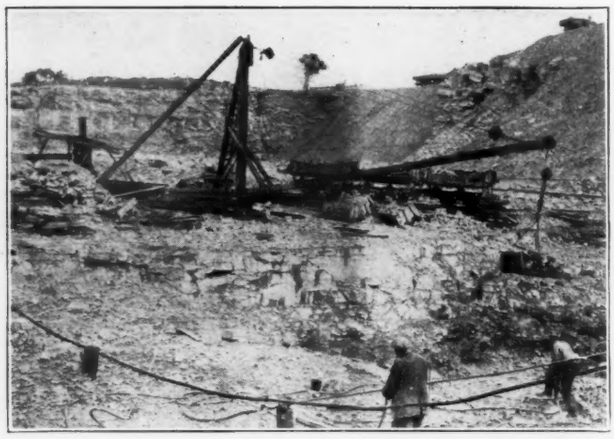


Dumping car of stone into primary jaw crusher

blasting and block-holing. All stone was hand loaded until 1920 when the shortage of labor necessitated the use of mechanical equipment. Only stone for chemical lime is now loaded by hand.

The shovels load into trains of three 4-cu. yd. Kilbourne and Jacobs side-dump cars which are hauled on a 36-in. track by two Vulcan 12-ton steam locomotives to the foot of the incline from the quarry. The chemical stone is loaded into Hudson

Loading hydrate stone by hand. Large shovels in background



**Opening new level in quarry, one-man drilling in foreground**

2-cu. yd. steel cars which are hauled by the same locomotives. The cars are then hauled up the 400-ft. incline from the quarry by an Allis-Chalmers 10,000-lb.-capacity hoist using 7/8-in. Dominion wire rope and driven by a Fairbanks-Morse 60 h.p. motor. Here they are taken over by an 18-ton Vulcan locomotive and hauled to the plant.

## Miscellaneous

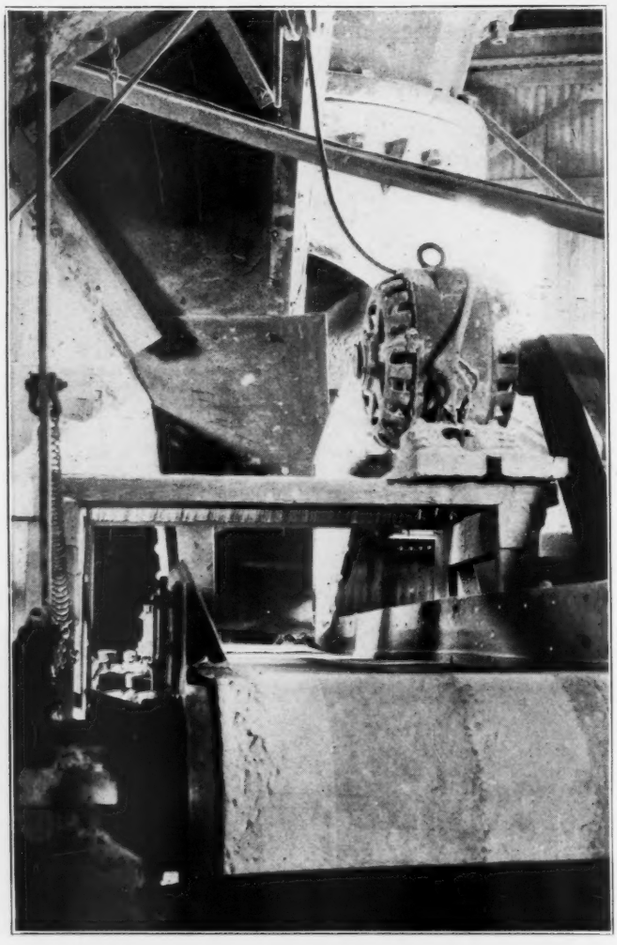
A sump 20 ft. deep has been excavated in the east end of the quarry, a temporary stiff-leg derrick handling the stone into cars. This sump will serve later as an opening for another level in the quarry. The existing floor is being leveled off, so that the next level can be more easily drilled and worked. Water is pumped from the sump through an 8-in. spiral pipe line to a drainage ditch nearby.

A repair shop at the quarry contains an Armstrong drill sharpener for the well-drill bits. This is belt-driven by a 10-h.p. Crocker-Wheeler motor. Armstrong bits which are used exclusively, need resharpening only after every 100 ft. of drilling. There are also a forge, drill-press, chain-hoist, small tools, and spare parts for making minor repairs. The home-made air-hammer which has given satisfactory service consists of an old Ingersoll-Rand No. 44 air drill mounted on a steel post with a steel pile-driver embedded in the concrete base.

A compressor house near the repair shop houses

**Main plant from northwest**

a Canadian Ingersoll-Rand two-stage compressor, with 10-in. by 10-in. and 12-in. by 14-in. cylinders, belt-driven by an Allis-Chalmers 2,200 volt, 50-hp. motor. Another compressor house in the quarry houses a Chicago Pneumatic single-stage 10-in. by 10-in. compressor driven by a 40-hp. motor which is used alternately with the larger compressor. A small roundhouse for the locomotives located near the compressor house, houses two spare 12-ton Vulcan steam locomotives which are used for hauling the overburden and coal for the shovels.



**Primary crusher, chute and conveyor**

## Plant Operations

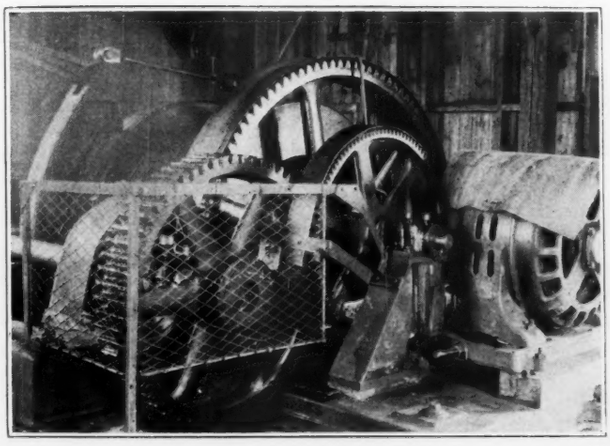
The shovel-loaded stone from the quarry is hauled up an incline and discharged into a Farrel-Bacon 42-in. by 36-in. primary jaw crusher which reduces to approximately 6 in. This is driven by a 150-hp. Allis-Chalmers motor. The crusher discharges onto a 36-in. pan conveyor to the secondary crusher building where it feeds a 72-in. by 10-ft. Allis-Chalmers revolving bar grizzly with 4 in. openings.

The oversize, which is used for regular lime burning, discharges into a 200-ton-capacity wooden

storage bin. The screened stone goes to a small bin feeding a Traylor No. 7½ gyratory crusher which reduces to 3 in. and under. This crusher discharges onto a 24-in. belt conveyor on 30-ft. centers which feeds a 24-in. inclined belt conveyor on 60-ft. centers to the screening building.

This conveyor discharges onto a heavy-duty Niagara single-deck vibrating grizzly with a 2½-in. square-mesh cast frame with alloy-steel bars inserted in the frame. The oversize goes to a No. 38 Kennedy-Van Saun gyratory crusher for re-crushing. The screened stone feeds to a 78-ft. belt bucket elevator with 16-in. by 22-in. buckets along with the crusher discharge. This discharges through a divided chute into two Austin 48-in. by 20-ft. revolving screens, each having an 8-ft. outer jacket with ½-in. perforations.

The two sizing screens turn out four sizes of stone: ½-in. to ¾-in.; ¾-in. to 1-in.; 1-in. to



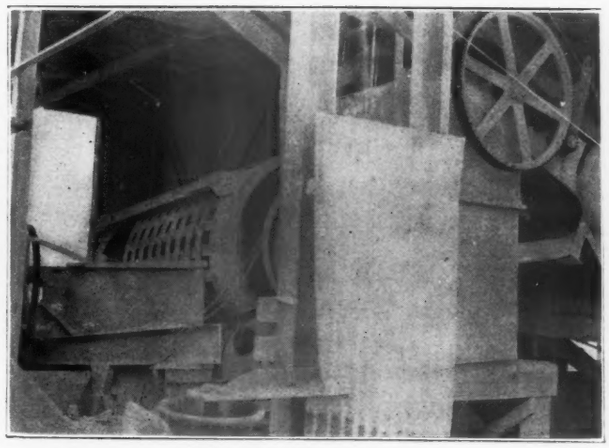
Electric hoist at quarry

1½-in.; and 1½-in. to 2-in. The stone over 2-in. is returned to the Kennedy-Van Saun crusher by a short belt conveyor. That under ½-in. goes to two own-make vibrating screens with ¼-in.-mesh wire cloth. The ¼-in. to ½-in. stone from these screens and the four sizes from the revolving screens go to five wooden storage bins of 50-ton-capacity each. These discharge into cars on a side-track for shipment or through special chutes into trucks. A small single drum hoist, driven through a Link Belt silent chain drive, spots the cars at the crushing plant.

## Pulverized Stone

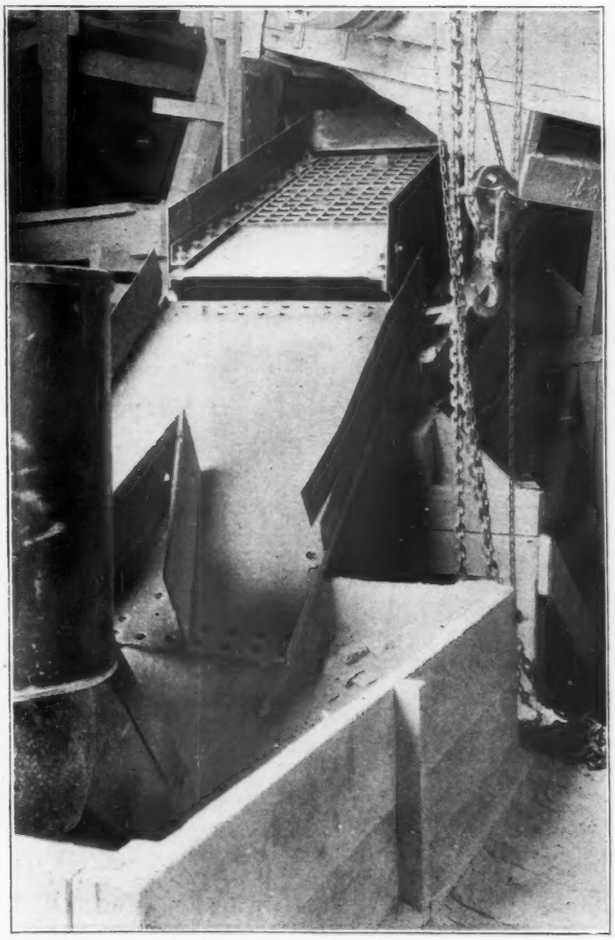
The material under ¼-in. passing through the vibrating screens (dust) goes through a chute into 4-cu. yd. cars which are hauled to the stone pulverizing plant. Here the stone is dumped into a pile from which it is fed by a horse-drawn slip-scraper to a bucket elevator which discharges into a small bin at the top of the plant. A 16-in. belt feeder carries the stone from the bin to a 4-ft. by 30-ft. Bonnot coal-fired direct-heat dryer.

An 8-in. screw conveyor carries the stone from

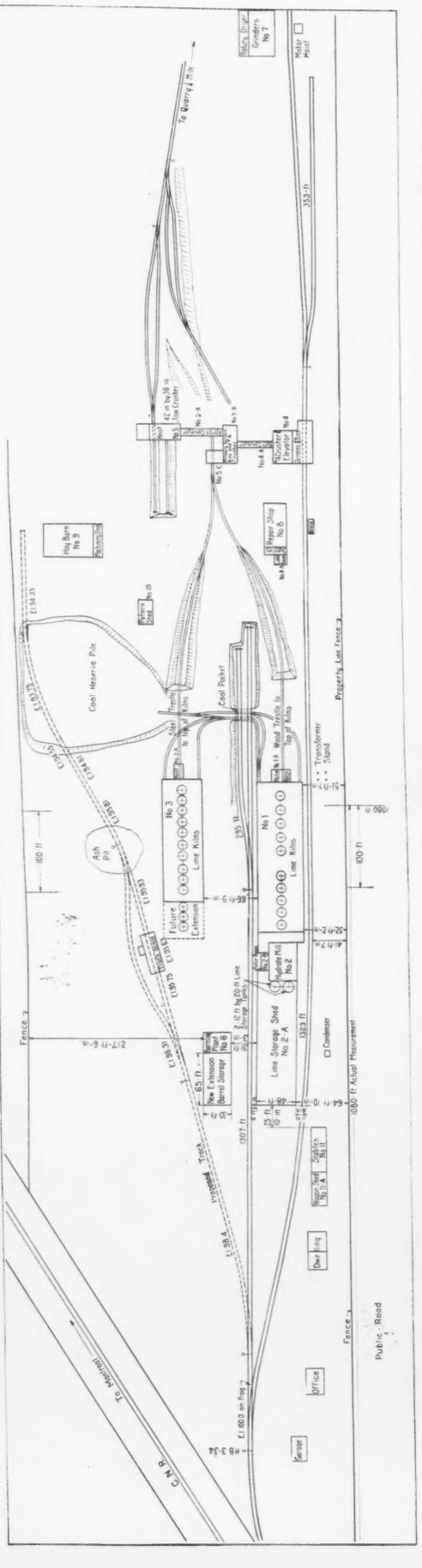


Revolving bar grizzly fed by conveyor at right

the dryer to a bucket elevator discharging into a 25-ton-capacity storage bin at the top of the building. Three screw feeders discharge from the bin into three Bonnot 24-in. ring-roll pulverizers with air separators which carry the dust to a 25-ton-capacity storage bin. The coarse material in the pulverizers remains in closed circuit until it also is pulverized. The bin feeds a 3-tube Bates bagger which packs the dust into 100-lb. jute bags. It is sold for paint filler, asphalt purposes, and agstone.



Heavy-duty vibrating screen and gyratory crusher

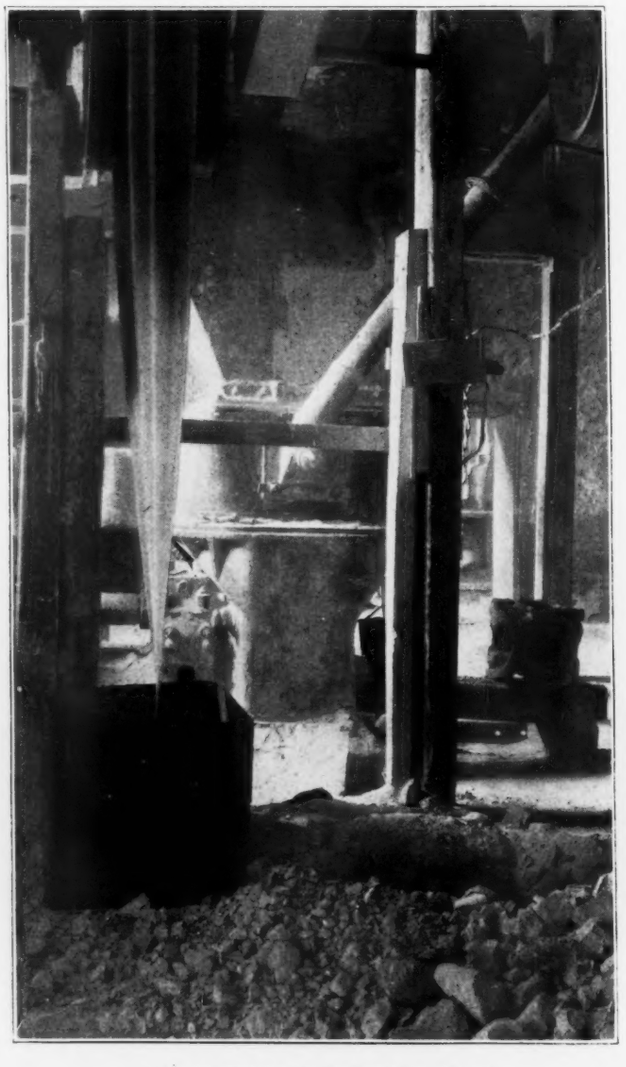



**Layout of lime and stone plant of Standard Lime Company at Joliette, Quebec. Note straight line flow of material from quarry to finished product. This is the largest as well as one of the oldest lime plants in Canada with a capacity of 225 tons of lump lime and 4 tons of hydrated lime per day. 1,500 tons of crushed stone are also produced daily**

**Dust building, scraper and elevator, with main plant in background**

## Lime

The 4-in. and larger stone rejected by the revolving grizzly is loaded by a Jeffrey pan conveyor into 1-cu. yd.-capacity steel cars on a 24-in. track. These are hauled by mules to the foot of the inclines to the kilns. Stephens-Adamson hoists haul the cars up, one at a time. This stone is used for regular lime. The cars of stone for chemical lime



**Air separator in hydrating plant**

Location of Standard Lime Company's plants

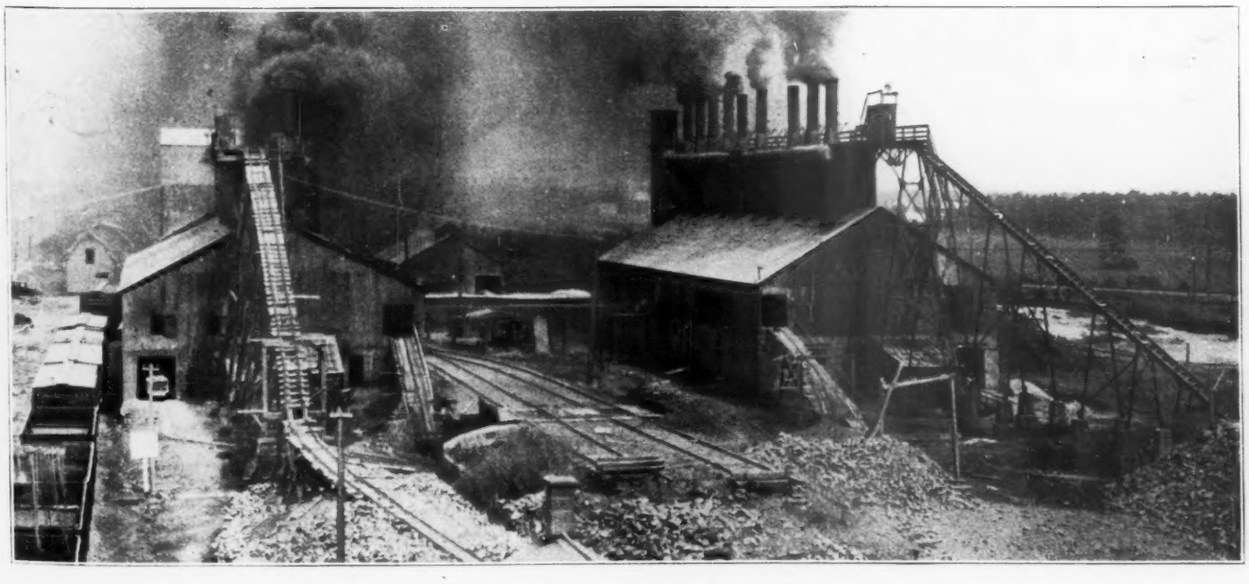
are hauled up the incline to the crushing building and are then switched onto a sidetrack and dumped into a 200-ton capacity bin. This also feeds, by Jeffrey pan conveyors, into the kiln cars. Some of the kilns are reserved for this stone from which the hydrated or chemical lime is made.

All of the kilns are coal fired and utilize the waste-heat gases. Each kiln is hand drawn every four hours into special steel cooling trucks which are then weighed. The cars are pushed along a track to a building near the kilns where they are dumped into a hopper. This discharges onto a 36-in. Jeffrey inclined pan conveyor which also serves as a picking table. The conveyor discharges onto a Jeffrey shaking grizzly which can be changed to any size from ¾-in. to 2-in. as desired.

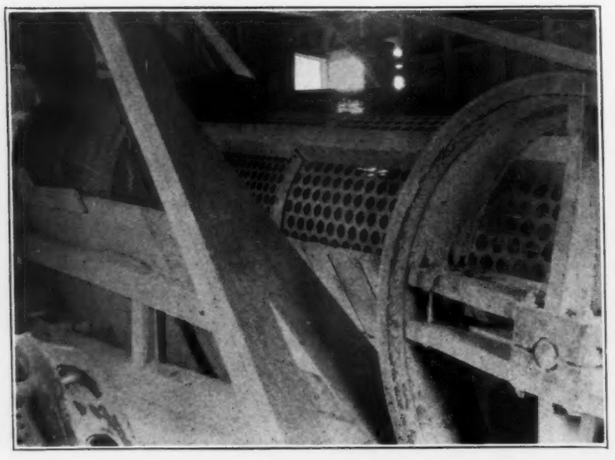
Open-door rotary crusher in hydrating plant

The oversize, or lump, lime goes through a chute onto a box-car loader which loads into cars for shipment. The fines discharge into steel trucks which are hauled to the hydrating plant.

The fine lime is shoveled from the cars into a Sturtevant No. 1 open door rotary crusher. This



The two kiln buildings viewed from screening building



One of the revolving screens and its feed conveyor in background

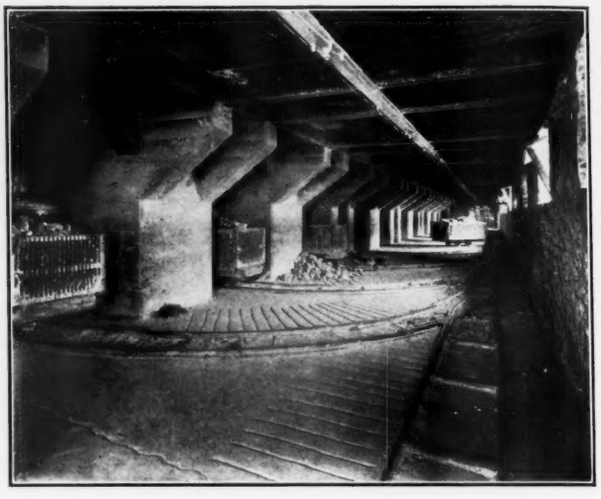
discharges to a bucket elevator feeding a small storage bin at the top of the building. A screw conveyor feeds from the bin into a 4-cylinder Kritzer continuous hydrator. Another screw conveyor carries the hydrated lime to a Raymond air separator which discharges into a 25-ton storage bin. This feeds a 4-tube Bates bagger using paper valve-bags. The entire mill is driven by a 50-hp. Allis-Chalmers motor. A screw conveyor, driven through a Foote speed reducer, takes the spill from the bagger and brings it back into circuit.

Some of the lime from the kilns instead of going to the picking conveyor is taken to a barreling plant where it is dumped onto the floor and hand-picked. The lime is then shoveled into a Jeffrey 24-in. single-roll crusher of the type commonly used for coal. This discharges into an elevator feeding a bin from which the lime is drawn into steel barrels for shipment.

## Miscellaneous

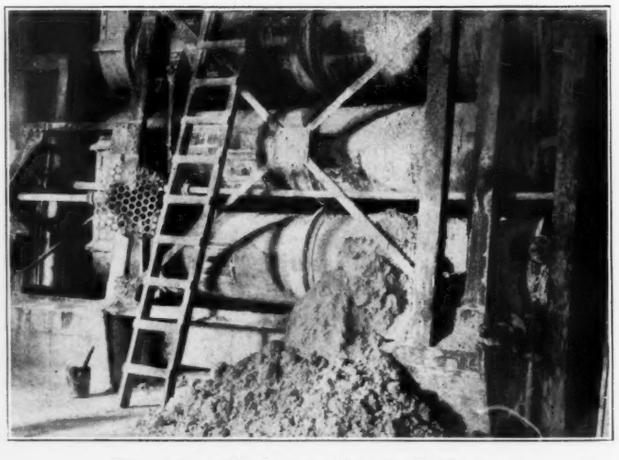
The elevators in the crushing plant are Link-Belt; all of the others are of own make using Jeffrey buckets and chains. All of the belt conveyor idlers are made locally and are equipped with Timken roller bearings and Alemite lubricating systems. Conveyor belting is furnished by the Dominion Rubber Company and most of the electric motors are Canadian General Electric.

The machine shop at the plant is equipped to make almost any repairs. Brass, aluminum, cast iron, alloy and manganese steel foundries in Joliette make possible any kind of repair work. The machine shop contains two bed lathes, a planer, drill-press, power hacksaw, forge, two emery wheels and other miscellaneous equipment, all of which is belt driven from an overhead shaft.

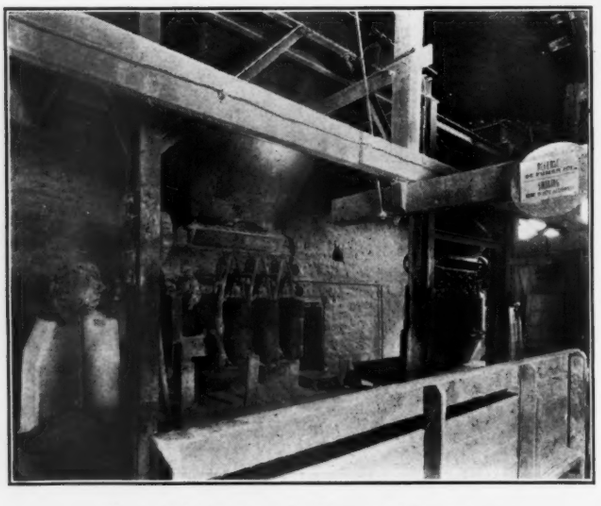


Kiln discharge room, showing cars and tracks on which lime is hauled away

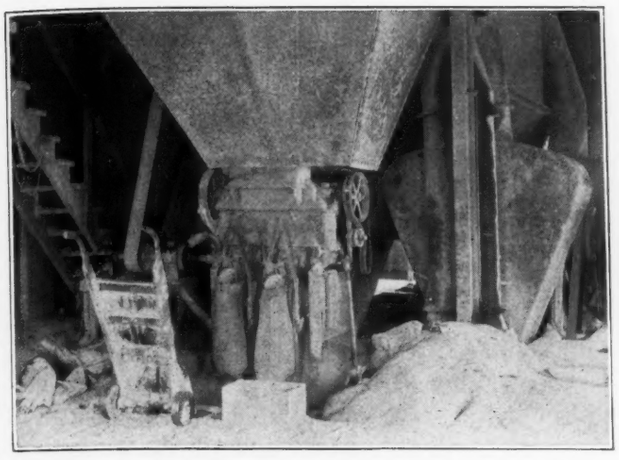
The plant and quarry are served by an almost unfailing source of electrical power. Power is brought in on four different lines at 2,200 volts, making a power failure practically impossible. Two of these wires come from Montreal and the other two from Shawinigan Falls almost 100 miles distant. Water for plant use comes from the city mains but there is an auxiliary pumping station at a nearby creek should the supply ever fail. This



The four-cylinder continuous hydrator



Four-tube bagger in lime packing room



**Bagger in the dust plant**

consists of a Fairbanks-Morse 1½-in. centrifugal pump driven by a 5-hp. motor. Coal for all plant operations is dumped from bottom discharge railroad cars on a trestle into a hopper feeding into small steel cars which are hauled by horses to any building desired.

### Officers, Etc.

A neat two-story office building on the property houses the main office of the Standard Lime Company's four plants as well as the plant and engineering offices of the Joliette plant. E. E. Lepine is managing director, H. E. Roy is assistant manager, A. R. Harden is engineer, and Marcel Lepine is general foreman.

The Standard Lime Company which, as previously stated, is a subsidiary of Canada Gypsum and Alabastine, Inc., operates three other plants. An 8 kiln lime plant at St. Marc des Carrieres, Quebec, produces 100 tons of lump lime and 150 tons of crushed stone per day. A plant in Montreal makes sand lime brick and wet mortar and has a retail yard for sand and gravel. A sand-and-gravel plant located on a 1,400 acre property 7 miles northeast of Joliette produces 40 cars of washed and graded sand and gravel per day.

## Obsolete Cement Equipment

By W. F. Schaphorst

There is too much obsolete cement equipment doing duty today—equipment that should be scrapped.

Most of our automobiles are junked as soon as they are out-of-date. They may not even be obsolete when they are discarded. We just don't like the "looks" of them and buy a new one.

Why do we persist in operating obsolete equipment in our industries, and at the same time persist in demanding strictly up-to-date pleasure equipment? To scrap obsolete industrial machinery PAYS, while the purchasing of new machinery every year to play with does NOT pay.

All of which raises the question: "When does a thing become obsolete?" So far as I know there is no rule or formula that positively answers this very important question. It is not easy to write a rule or formula that is applicable to everything.

It may be that you as an automobile owner declare that your car becomes obsolete in one year and therefore you annually trade it in for a new one. But the "old" car still continues to run for a number of years in the hands of subsequent owners. Whether or not your automobile is really obsolete is therefore largely your own whim.

I know of steam power plants in which ten-year-old engines or turbines have been "junked" and replaced by more efficient apparatus.

You and I have our own ideas about obsolete clothes and when they should be replaced. The average man "wears out" one straw hat and one felt hat each year. Women "wear out" hats more rapidly than men. Some people use lead pencils until they are "stubs." Others discard them as soon as they are inconveniently short. And so on.

But let us get down to brass tacks. What we are looking for is a good rule or formula. My own answer to the question is this: A thing is obsolete as soon as it is found that it will PAY to replace it.

Sometimes it pays to throw out machines that are new. I was once employed by a concern that manufactured a decidedly inefficient machine. I didn't know it was inefficient and uneconomical at the time or I would not have worked for them. The company was in business for three years and then were forced to quit because nobody would buy. Many of the machines were replaced inside of a year because they actually were obsolete before they were installed. They were "new," yes, but obsolete nevertheless because it paid the purchasers to install something better immediately.

Simply because we can "get along" with an old machine, part, or thing, is no proof that it is not already obsolete. My contention is that entirely too much machinery is in daily use that should be in the scrap heap.

## An Appreciation

We are in receipt of a letter from the first vice-president of a company whose plant was described in a recent issue of PIT AND QUARRY. Following are brief excerpts: "We took great preasure in reading your fine article about this plant and looking over the new departments in the larger magazine. We trust your growth will continue and believe it will if you continue to make the magazine as interesting every issue as this last one proved to be. This is in addition to the article about our plant. . . . Whenever you are in this part of the country do not fail to look us up and write us when we can give you any needed information."

# Operator Suggests Means of Improving Conditions in the Crushed-Stone Industry

By R. N. VAN WINKLE
General Manager, American Crushed Rock Company, Delaware, Ohio

THE crushed stone industry as a whole is laboring unquestionably under the great handicap of overproduction. While no doubt there may be territories and localities where such a condition is not the case, overproduction in the crushed-stone industry today is the rule rather than the exception.

If the old adage "misery loves company" is true and, moreover, if we can get any satisfaction from such a foolish expression, there is nothing for us to be concerned or worried about. If, on the other hand, we are experiencing this condition of overproduction and are reaching the saturation point for the uses of crushed stone, we might profit by investigating the procedure and methods used in such national industries such as oil, cotton, automobile, steel and other industries too numerous to mention, to overcome this condition of overproduction or saturation.

In quite a few respects and in a general way, our troubles in the crushed-stone industry are as much like the troubles experienced by other national industries as two peas when compared and analyzed. Again they are as different as day is from night. Still satisfactory results have been accomplished and obtained in other lines of national industry in the handling of overproduction or saturation by help from within, without putting the entire blame on the consuming public, laws, regulations, public sentiment, and so on. Other national industries have accomplished outstanding results in their own particular lines by the regulation of production, cooperation in sales, mass national advertising, united price stabilization, and similar measures. Practically all of the above measures or remedies and possibly many more are truly and rightfully applicable to our industry but seemingly are not workable nor conducive to proper results.

Just why they are not workable or conducive to proper results when applied to the crushed-stone industry I need not attempt to state. First, regulation of production means, in reality, curtailed production. Are you or any of your competitors going to shut down operation or curtail production to help the industry? Second, are you or any of your competitors truthfully and honestly going to cooperate in sales if the practice should reduce your sales one bit? Third, are you or any of your competitors going to donate or subscribe real cash to a national advertising campaign to show the many uses of crushed stone? Fourth, are you or any of your competitors going to unite to stabilize prices if such action might lose you business?

Assuming that the reader, being a crushed-stone operator, may be too backward to answer any or all of the above questions, I will be so bold as to answer them all with the letters N-O. My answer is based on personal experience after many years of constant association with many quarry owners and operators in many districts. The reason for the negative answer, I am frank to say, I do not exactly know. I wish I did know. It may be that the industry is too young; possibly quarry owners and operators as a whole are not big time, modern business executives; or possibly the industry is underestimated by the very men who own and operate it or they have not faith and confidence in their associates and competitors.

There are, possibly, many reasons, reasons we may never know; but I do know, from my own experience in attempting to organize quarrymen, my own experience in committees, experience in sales and territory meetings, that it is next to impossible to get the past or present quarry owner and operator to stand hitched or to stay put long enough at any one time to test out any new plan or scheme. The writer does not make this statement braggingly, nor is it said with an idea to arouse the ire of the reader. These are facts and I am as ashamed of them as anyone, I believe, for I am one of the would-be organizers of our crushed-stone industry—at least I have tried it and faithfully.

While we may learn many valuable things from other industries of national scope and think it worth while to watch and study our neighboring industries for new business practices and methods which can be successfully applied or modified to apply to our particular industry, it seems that we are handicapped to a certain extent, as our particular industry, in many ways, is peculiar unto itself. By this is meant that we, in the quarry business (and when I say quarry business, I mean crushed-stone industry), do not produce nor manufacture what can be rightly termed a finished product. We have nothing to sell or offer to the actual consumer such as clothes, shoes, food products, or any nationally advertised goods. We are forced, by circumstances, to sell to a select, restricted few, such as contractors, state, county and townships, railroads and engineers. Our sales contact is limited

as everyone is not a potential prospect for a carload or a truckload of crushed stone. We are forced by circumstances, in many instances, to do business with a middleman, the contractor, the state, county or township official, the railroad or the engineer who, in turn, embodies our product into a building road, dam, foundation or some project, structure or improvement which, in turn, is handed on the actual consumer or customer as a unit, a finished usable something, so to speak. Even if crushed stone did play a big and important part in the making of this something (which it often does) I believe that few people would know about it and even care less. Therefore our identity as manufacturers and marketers is lost and we have no real contract with the owner, customer or final user of the improvement. The automobile, radio, electric refrigeration and aviation industries have real personal appeal and actual contact with the consumer, but this appeal and contact we do not have, so herein lies one of the paramount differences between our industry and some of the other nationally known industries.

The writer has been a student of the crushed-stone industry and has followed, insofar as he was able, each improvement, development and step in the industry. He has watched this matter of overproduction and absence of regulation grow to a point where he believes it is hurting individually and collectively more than any of us are willing to admit. Some solution must be found to stop flooding the market with cheap stone and, at the same time building new plants, opening new quarries and increasing capacities of existing plants. Surely in this respect we should learn something from the soft-coal industry, but seemingly we do not as we are doing just the identical things that have brought that industry face to face with almost disaster.

Well, in the finality, what does all this mean? What is it leading us to? What is the solution, if any? It appears obvious if we cannot stop overproduction and if we cannot regulate, from within our own industry, which seemingly we cannot, we are bound to do one of two things: first, either seek bigger or increased markets for our products; second, let the financial interests consolidate us and force us to stop overproduction or let them do it for us.

Of these two solutions (provided the writer is correct in assuming there are only two) we, as business men, would prefer working out our own salvation without outside help and we would rather seek bigger or increased markets for our products. Then the question arises, where are the bigger and increased markets to be found?

An article read by the writer recently gave the solution of finding the bigger and increased markets for our particular product, crushed stone. This article brought out the point that, if the automobile industry is to continue and the motor car, the wonder child of the twentieth century is to continue to be sold, more roads and highways might be built. The saturation point in the automobile industry, it is claimed, will never be reached so long as there are roads over which to drive cars. The claim is further made that the saturation point as far as roads are concerned has about been reached. This last claim sounds true, especially if one has experience trying to ride on a Sunday or holiday over the improved roads or highways in his own community. To quote from the article by Earnest Emlo Calkins in the Atlantic Monthly Magazine: "The willingness of the American public to buy a car, bringing the daily problem of not merely a place to park it when still, but also a place to drive it when in motion, is amazing. The saturation point of roads is reached long before the public buying power has been plumbed. Strange that an industry so forward-looking, so quick to seize an advantage, so ready to adjust itself to trends of taste and fashion, has not considered this matter of more motor roads, and approached it with the same energy with which it has approached and solved mechanical, artistic, and selling problems, especially when the reserve supply of undeveloped roads in the United States is so abundant."

As set out in a previous paragraph, we, in the crushed-stone industry, have, owing to the commodity we sell, no direct or personal sales appeal to the people as a whole. We cannot say that there is anything beautiful, striking or appealing to a car of crushed stone of any size, color or grade but there is something engrossly fascinating about driving a good-looking automobile over a nice piece of highway. Still another angle to be seriously considered is that we ourselves, due to the very fact that we are quarry owners and producers of crushed stone, are put at some disadvantage sometimes when we openly and directly agitate, propose, or foster road construction. In most instances we draw fire and kill our purpose and are immediately confronted with propaganda that we are acting for solely selfish reasons namely, to bring profit to ourselves.

As the above quotation gave me the idea, the following quotation expanded it as I read on, "A factor in bringing about any reform is public opinion, and public opinion is something that can be created. There is immediately available a tremendous nucleus for such a public opinion. The number of people now vitally interested in the success of the motor industry is a large community in itself, larger than has put over a new idea in the past. Including not only manufacturers and

workmen, but also retail dealers and their salesmen, garage employees, professional drivers, the gas and oil industry, and workers in accessory lines created and maintained by the automobile, four million people are supported by the motor industry. Four million people are a large fraction of the United States. With their dependents they comprise one-seventh of the population. Four million people whose minds are directed toward one end can sway the nation. Less than that number have elected a president. Here is ready a magnificent lobby of gigantic proportions with a laudable object. The thing is to organize it, mobilize it, and make it felt in Washington and elsewhere until a road program is adopted which will lead to the best system of highways in the world."

Here, it appears, are two ready-made organizations alive to the situation and willing to help us—the automobile manufacturer on the one hand, and the army of men and women supported directly and indirectly by the automotive industry. Here are our increased middlemen, our personal contact men, or boosters, our propagandists. Good roads and highways have a personal appeal, and here are four million or more people who want and must have good roads and more roads to be successful themselves. Right here is one great thing that these four million or more people have in common with us quarry owners and operators, so why can't we use it, capitalize on it, and turn it to our account? It appears to me as a real opportunity.

It is to road and highway building that we, as quarrymen, must look for bigger and increased markets for our products for there is no doubt that the automobile has come to stay. The past and present road and highway building programs may appear big to us but as most broad-minded and progressive people look at it, it is only in its infancy. Road and highway maintenance and repair (if the writer is not mistaken) will require more crushed stone within a few years than we are now furnishing for use in new construction. Both road and highway construction and maintenance offer to the quarryman his biggest future market but we must see to it that we enlist the help and support possible from every one we can to keep the road and highway building question before the public eye as that is our future salvation.

It is, as a rule, the stay-at-home, narrow-minded individual who is against road improvements, often arguing that this or that particular road does not need improving because it is not much used. That is often a reason that will not stand, the truth being that the road is not used much because it is not improved. Open a new road in even an isolated territory and one wonders where the traffic comes from. No one, not even you or I, wants to ride over an unimproved road; but improve that road and it will be used by many. Each new or improved road tends to relieve traffic congestion, fast becoming one of our national problems today. Traffic or road congestion should be a national problem, for approximately 25,000,000 people ride in automobiles every day in this country, and this number is constantly increased.

Recent statistics show that automobiles are being built far faster than are the roads and highways on which they are built to run; and, with automobile accidents staggering our imagination, what may we look for in the way of accidents in the future with more and more automobiles?

Perhaps this article is not a new thought at all but just an old idea dressed over in a new style. If that is a fact and the new dress or style has attracted your attention, the time in writing this article has been well spent. The writer realizes that the individual quarryman or even the crushed-stone industry is not nearly large enough, rich enough or powerful enough to influence public opinion; but unquestionably we can create some thunder and if we could become allied or could cooperate through some channel with the automobile industry, it would at least do us no harm. In road and highway building lies the future larger and increased markets for the quarryman, and, in the automotive industry, lies an army of middlemen to promote our product for us. The desire for more roads is what must be kept aflame.

Just one word of caution. In our endeavor to promote agitation for more roads and highways we should not be narrow-minded nor drawn into any arguments regarding types of aggregate to be used. It will suffice for the quarryman just to be in favor of good roads and each of us will get his share of business. Unquestionably the combined efforts of all who are vitally interested will sway public opinion and will create public demand for more roads and highways which will mean bigger and better markets for us.

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## New Geologic and Economic Map of Arkansas

The Arkansas Geological Survey has recently published a large wall map of its state that should prove of peculiar interest to all persons who have business in or who traverse Arkansas. All townships are shown, as well as every city and settlement. Geology is shown in detail by the conventional color scheme and vertical cross-sections are shown diagrammatically. In addition, all railroads, power-transmission lines, oil and gas pipe-lines, mines, quarries, pits, mineral-treatment plants, and wells are carefully shown.

The map can be obtained from George C. Branner, state geologist, State Capitol, Little Rock, Ark.

# Three Forks Portland Cement Company's Trident Plant Was First in Montana

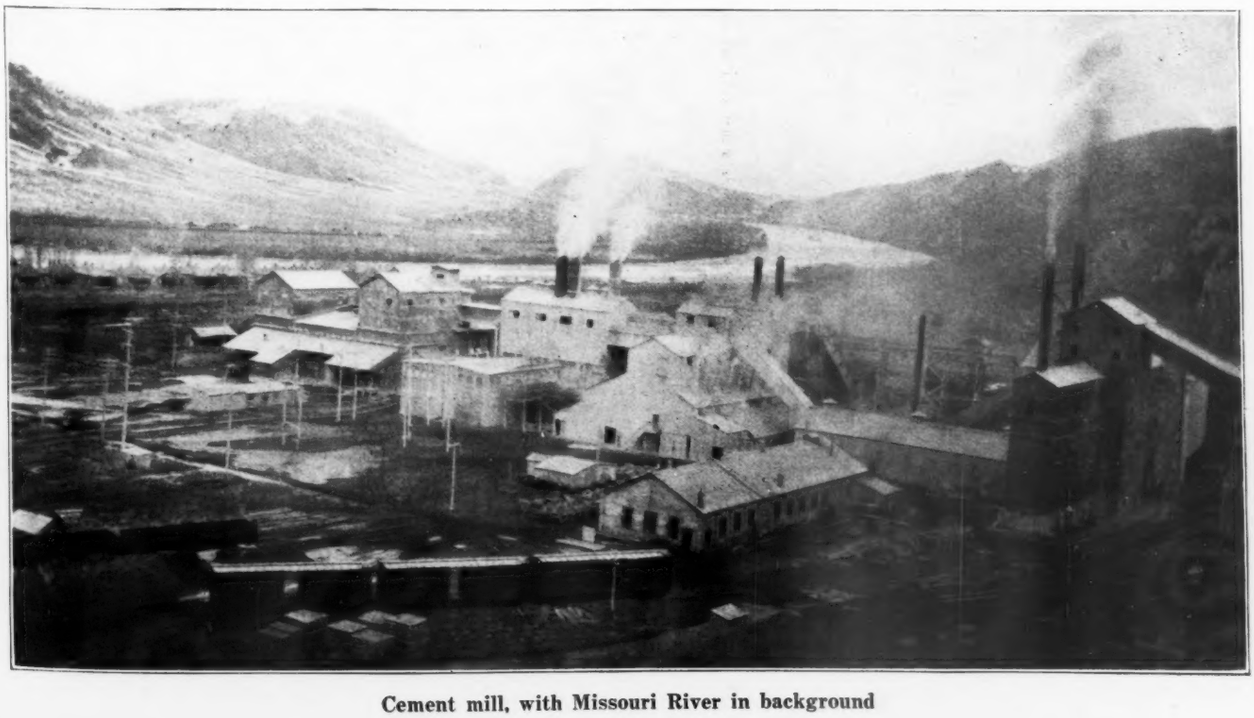
By F. C. LINCOLN
Professor of Mining, South Dakota State School of Mines, Rapid City, South Dakota

THIRTY years ago, a group of Colorado men under the leadership of Charles Boettcher organized the Colorado Portland Cement Company and built a plant at Portland, Colorado. A little later, some members of this group joined with Utah capitalists to incorporate the Union Portland Cement Company which constructed a plant at Devil's Slide, Utah. Soon after the completion of the Devil's Slide plant, these Colorado and Utah financiers associated themselves with some Montana investors and formed the Three Forks Portland Cement Company which erected a plant at Trident, Montana.

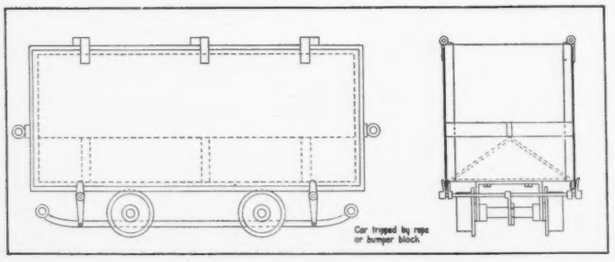
A holding company, called the Cement Securities Company, was organized in Colorado and acquired all the capital stock of the Colorado, Utah, and Montana companies, and nearly twenty years ago the management of the Montana company was moved to Denver, followed a little later by the management of the Utah company. The Cement Securities Company eventually came into control of ten cement plants, and was recently succeeded by the Ideal Cement Company of Denver.

The Trident Plant is one of the ten plants of the Ideal Cement Company and was the first cement plant built in Montana, having been constructed by F. L. Smidth & Company in 1909 and put in operation in June, 1910. Originally a 2-kiln plant with a daily capacity of 1,500 barrels, a third kiln

R. J. Morse, general manager, Idaho Portland Cement Co.



Cement mill, with Missouri River in background




Coyote car

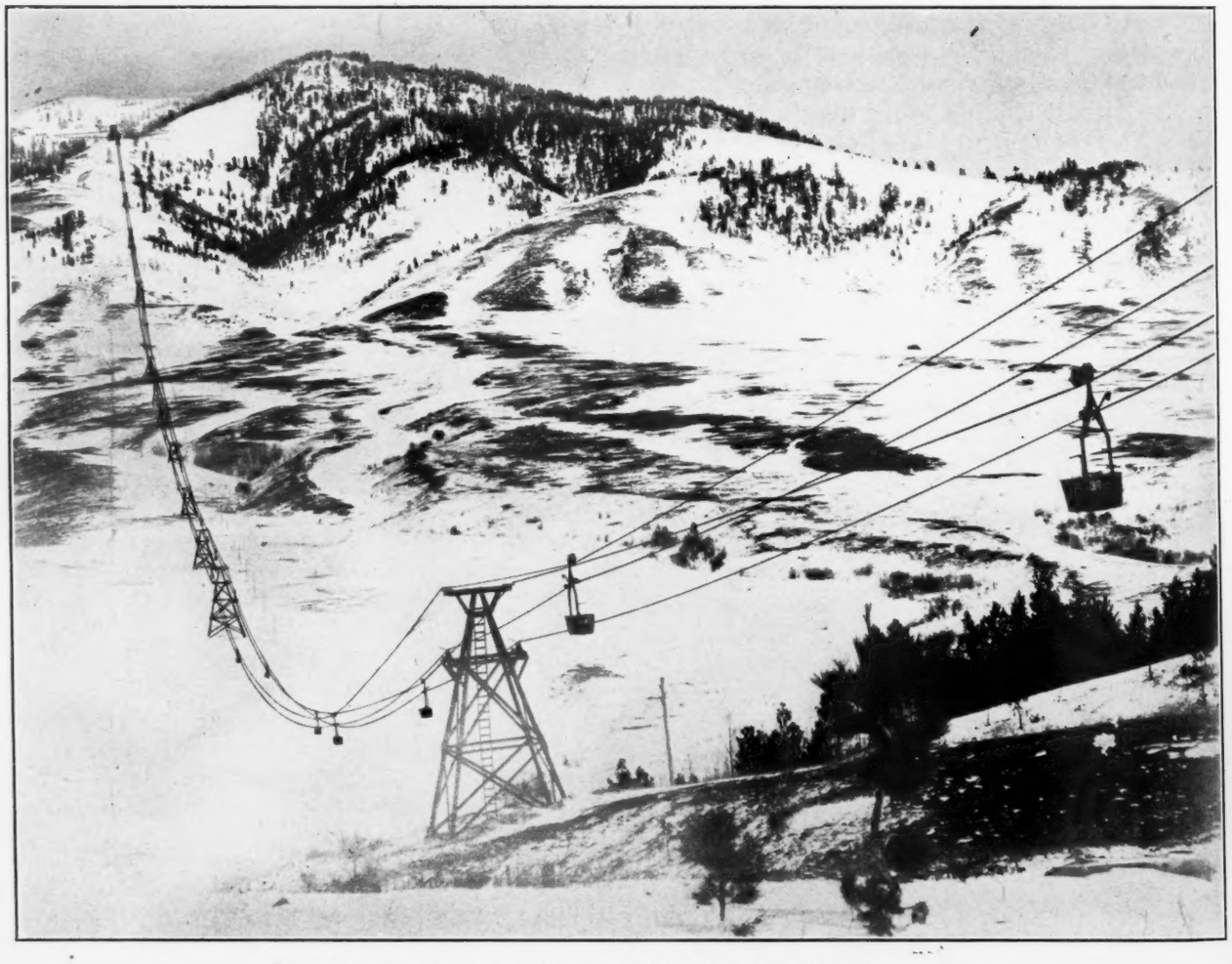
was added in 1913 increasing its capacity to 2,250 barrels. In 1916, the Three Forks Portland Cement Company purchased the property of the Hanover Gypsum Company near Lewistown, Montana, and in 1918 erected a cement plant on this ground. The Trident and Hanover Plants now maintain a joint sales office in Butte and supply the Red Devil Brand of portland cement to Montana, Wyoming, North Dakota and Idaho points.

## Personnel of the Company

Charles Boettcher is president of the Ideal Cement Company and R. J. Morse is vice-president and general manager. Mr. Boettcher has been the leading spirit in the enterprise throughout its history. Mr. Morse became secretary in 1904 and general manager shortly afterwards. E. U. Leh was formerly the general superintendent of both the Trident and Hanover plants of the Three Forks Portland Cement Company. His son, Clark F. Leh, who holds A.B. and M.E. degrees from Stanford University, went to Hanover as plant engineer after the war, and was transferred to Trident in 1921 and to the Denver office in 1925. When his father resigned in 1927, Clark F. Leh was made superintendent of the Trident plant, a position which he fills most ably. Associated with Mr. Leh at Trident are a number of good cement men who have been in the employ of the company for many years. A. S. Wood, general mill foreman, attended Michigan Agricultural College and has been with the company since 1912. A. D. Burkett, chief chemist, has been with the company since 1916. He is a graduate of Montana State College, as is also Glen Luther, chief electrician. Stanley Wilson, mill foreman, and E. R. Helm, master mechanic, have also been long employed by the company.

## Geographical Location

Trident is on the main line of the Northern Pacific Railway 6 miles northwest of Logan on the Helena route; while by highway it is 6½ miles northeast of Three Forks which is on the Butte



View from tension station toward loading terminal of aerial tramway

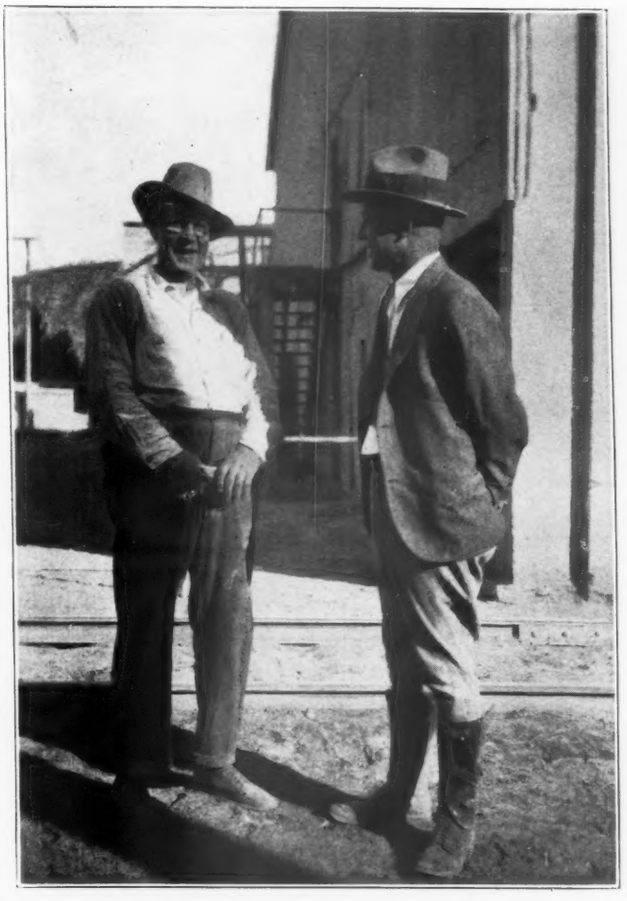
route of the Northern Pacific. Plant, town, and quarry are all on the east bank of the Missouri River, ½ mile north of the point where it is formed by the confluence of the Jefferson, Madison and Gallatin Rivers, the "three forks." This is historic ground, having been visited and described by Lewis and Clark in 1805. The elevation above sea-level is 4,050 feet. Just across the Missouri River are the tracks of the Chicago, Milwaukee & St. Paul Railway. At present connection can only be made with this railway by shipping over the Northern Pacific to Lombard, 14 miles distant; but the feasibility of piping cement across the river is now under consideration.

## Geological Description

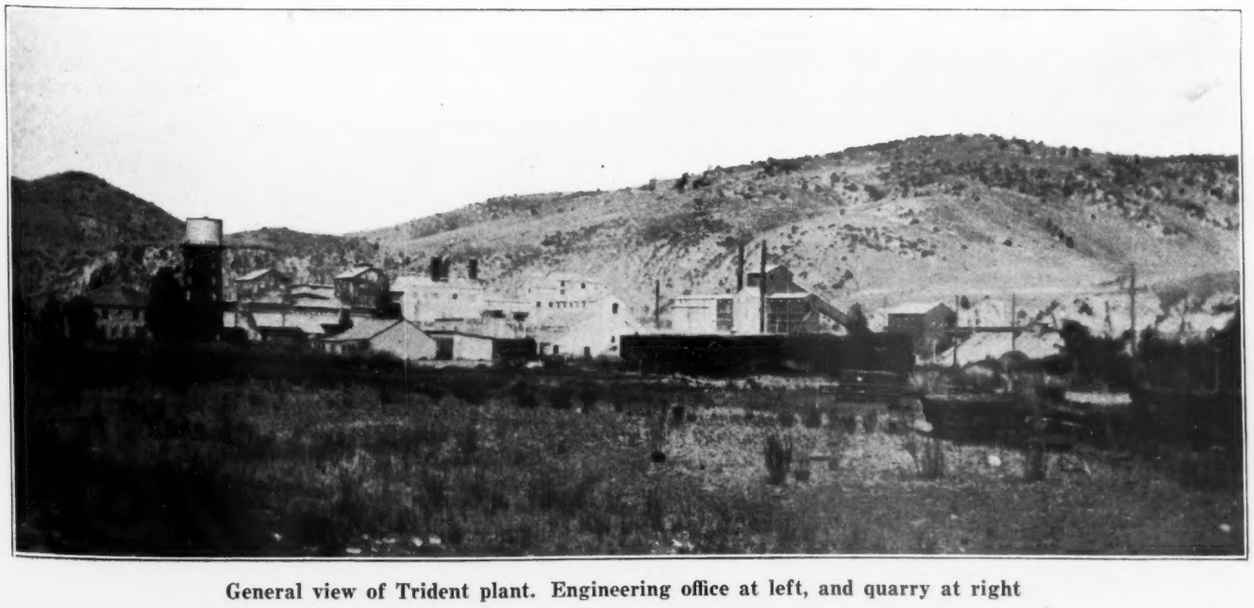
The raw material employed in the manufacture of portland cement at Trident is the Three Forks shale, an argillaceous limestone of devonian age. This formation normally underlies the Madison limestone of the Lower Mississippian age, but at Trident has been faulted up into the Madison. The low calcium limestone quarried runs about 70 per cent calcium carbonate, and the high calcium limestone 85 to 86 per cent calcium carbonate.

## Quarrying Methods

The Trident cement rock quarry is located upon a hillside adjoining the cement plant. The quarry face is about one-half mile in length and has a maximum height of 140 ft. Both well-drill hole and coyote hole methods of breaking ground have been tried, but neither proved satisfactory, and a combination method has recently been introduced which produces better results. Past difficulties have been caused by clay seams in the quarry. When well-drill holes alone were employed and the face was carried perpendicular, large boulders would work on the clay seams and fall down. To prevent this danger, quite a long toe is necessary, making it impracticable to use well-drill holes for the entire depth. When coyote holes were used alone, very heavy charges were required in each pocket on account of the great height of the face; and when these charges were located close to clay seams, they expended much of their energy along these seams instead of using it in breaking rock. With a lower face and lighter charges, but little energy is wasted on clay seams. For these reasons,



**Stanley Wilson, mill foreman; (left) and Clarke F. Leh, superintendent**



**General view of Trident plant. Engineering office at left, and quarry at right**

Coyote car on mine dump

the upper half of the quarry face is now being broken from well-drill holes and the lower half from coyote holes. By making a rough division of the quarry into upper and lower sections and using well-drill holes above and coyote holes below, the required toe can be kept and a greater breakage obtained for each pound of powder used.

## Drilling, Blasting and Loading

The blast-holes for breaking the upper half of the quarry face are bored with a No. 25 Armstrong portable gasoline well-drill, using a 6-inch bit. Holes are spaced from 15 to 18 ft. apart and 18 ft. back from the face. They are loaded with 40 per cent straight dynamite, tamped with the sandy soil of the overburden, and fired with Cordeau. As many as 18 and 20 holes have been shot at a time, but usually not over 10 or 12 are fired at once. One pound of dynamite breaks about 4 tons of limestone.

The coyote holes are made as small as a man can enter. Where timbered, they are 30 by 30 in. inside measurement. They are run horizontally into the face, 3 feet above quarry grade, for 30 to 35 feet. At the end is a crosscut running about 30 feet in each direction, and about 20 feet nearer the face a second similar crosscut. Powder pockets are sunk in these crosscuts to depths of 1 or 2 feet below quarry level and are spaced 20 feet or less apart. These powder pockets are loaded with 4F black powder, primed with 25 pounds of 40 per cent dynamite each, tamped with sacked tamping, and fired by Cordeau laced through them. One pound of powder breaks 2½ tons of limestone. Up to 6 coyote holes are shot at one time. A variation in the length of crosscuts is commonly made in the outer members of sets of coyote-holes fired simultaneously.

In the case of these outside holes, the branch of the crosscut nearest the entrance and on the side away from the other holes is usually extended to a greater length than the branch of the crosscut on that side farthest from the entrance. This produces a curved face at the end of the broken ground, which is easier for a steam-shovel to load than a rectangular face. To remove the material broken during the excavation of the coyote-holes, a most ingenious and efficient coyote car has been invented. This is a small steel car, 36 inches long by 14 inches wide, dumping to the sides over a gable bottom. It is equipped with a main rope passing over a sheave on the dump outside, an automatic dumping device attached to the track near the sheave, and a tail rope for returning it to the hole. The man working inside the coyote-hole loads his car, pulls it outside where it automatically dumps, and pulls back the empty car, without leaving the coyote-hole.

Blockholding for secondary blasting is accomplished by 5 Ingersoll-Rand Jackhamer drills which are supplied with compressed air by an Imperial Type XCB air compressor. Two 70-C Bucyrus steam-shovels load the broken rock into 9-ton bottom-dump quarry cars. These shovels employ egg-nut coal from the Roundup and Red Lodge coal-fields for fuel; and, since this can be the more readily and cheaply secured in winter, the quarrying is usually done in that season although temperatures as low as 55 deg. F. below are occasionally registered. A 15-ton Vulcan steam-locomotive hauls the quarry cars to the crusher house, where they are dumped over a rail chute directly into the primary crusher.

## Coarse Crushing

The primary breaker in the crusher house is a No. 9 McCully gyratory crusher. The crushed cement rock is elevated to a 4 by 18 scalping screen with 2-in. round holes, and the oversize from this revolving screen is sent either to a No. 5 McCully gyratory crusher or to a 36 by 42 Jeffrey swing hammer pulverizer. Experiments with the latter crusher have demonstrated that it does more satisfactory work with about half its hammers removed. The full set of hammers produces an excessive amount of dust which causes trouble later by spilling back from the driers into the dust

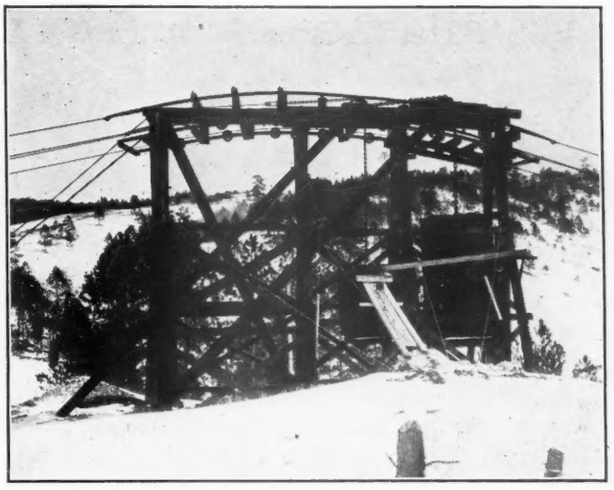
Trident quarry. Mill on rim

chambers. This hammer pulverizer is run by a 100 hp. electric motor, uses about 90 hp., and will handle 70 tons of oversize limestone per hour. A Bartlett & Snow 24-inch inclined-pan conveyor takes the crushed limestone from the crushing plant to the cement mill. This conveyor has occasionally given trouble as the result of the spilling or freezing of rock upon its rails, and to obviate this difficulty an ingenious device has just been installed. At intervals of 12 feet along the conveyor, uprights carrying pins which project above the conveyor have been installed. These pins are in electrical connection with the circuit which operates the conveyor, so that when rock on the track raises the conveyor till it knocks out one of these pins, the circuit is broken and the conveyor stops before a bad wreck can occur.

## Mixing and Drying

The cement mill employs the dry process. When it was built in 1909 by F. L. Smidth & Company it was a most up-to-date plant, and even today the results achieved compare favorably with those of many modern plants. From the inclined-pan conveyor, the crushed limestone goes to blending bins where it is automatically sampled. There are 8 of these bins, each with a capacity of 160 tons. A continuous sampling system is used by which a 20-lb. sample is obtained from each bin. There are also two large concrete reserve silos with capacities of 1,400 tons each which are employed as reservoirs for surplus limestone. After it has been sampled and analyzed, belt conveyors traveling beneath the bins carry the crushed limestone to the Fairbanks-Morse mixing scale, where high and low-calcium rock are weighed out in proper proportions. From the scale hoppers, the rock is elevated to bins above the dryers. There are two of these dryers which were built by the Vulcan Iron Works, one 8½ to 7 by 60 and the other 6 by 60; and they reduce the moisture content of the rock from about 4½ per cent to about ½ per cent. Slack coal fed by Jones automatic stokers is used as fuel. Bartlett & Snow inclined-pan conveyors elevate the dried rock to the grinding room.

**(Left to right), back row: Ray Craven, Stanley Wilson, Clarke F. Leh, E. R. Helm, Joe Mihelick, J. G. Luther; front row: R. E. Weber, A. S. Wood**



**Tension station. Note anchorage ropes and weight boxes**

## Grinding and Burning

The material in the bins in the grinding room is reduced in two stages, first by kominuters and second by tube mills. What is known as a closed system is employed, which makes it possible to use any mill on raw material or on clinker. There are five No. 66 and one No. 85 F. L. Smidth kominuters and six F. L. Smidth 6 by 22 tube mills; 5-inch balls are employed for the coarse grinding in the kominuters and 1¼-inch balls for the fine grinding in the tube mills. Screw conveyors collect and elevate the ground material to the kilns. These conveyors were made in the company's shop. There are three kilns, each 9½ to 9 by 140, and having a combined capacity of 2,250 barrels per day. Powdered coal is used as fuel. The clinker is conveyed by a McCaslin conveyor to two rotary coolers, 7 by 60. From the cooler it goes either directly to the grinding room described above or to one of 2 outside storage piles, from one of which it is recovered by drag and from the other by tunnel. Crude gypsum, 3 per cent of the mix, is shipped from the Hanover Plant and added before grinding.

The finished storage consists of 5 concrete bins with a capacity of 40,000 barrels. Two 3-tube Bates packers are used in the packing house. Individual coal feed screw drives were installed together with Thwing stack pyrometers in 1922 which increased the output 50 to 60 barrels per day. Recently revolution counters have been placed on the coal feed, the raw material feed, and the kilns with a view to comparing the results ob- a further spirit of rivalry.

## Coal Mill

Slack coal from the Red Lodge, Bear Creek, and Roundup coal fields is received at the coal mill in gondola cars. The cars dump into a track hopper from which the coal is either elevated to a 2,500-

(*Continued on page* 46)

# Influence of Sugar on Setting and Hardening of Portland Cement*

Dr. H. W. GONELL

IT HAS been observed for a long time past that the presence of sugar in the cement or in the water used in preparing the mixture retards or completely prevents its setting. This is possibly the cause of the failure of cement to set properly when shipped in old sugar sacks. The poor results obtained with cement in sugar refineries is also due to this action. It has been established that even small amounts of sugar, namely 0.2 or 0.4 per cent on the weight of the cement are sufficient to disturb the setting process.

Careful experimentation in the laboratory has revealed that even 0.1 per cent of sugar will retard the setting process and effect a considerable reduction of strength. It was observed that less than 0.25 per cent of sugar in the water will favorably affect the hardening process, but when greater concentrations are employed, there is an increasing reduction of the early strength of the cement. When the cement is stored for three months to a year, the strength returns almost to normal. There does not apparently appear to be any agreement between the various results obtained from these researches.

The investigation of the action of sugar on cement was carried out in three different ways. Microscopical examination was also made. In as much as earlier investigations carried out on the action of low concentrations of sugar solutions did not lead to any conclusive results, an attempt was also made to solve the problem by exceeding the limiting conditions of the experiments. Accordingly, sugar solutions of 1 to 10 per cent concentration were employed in the experiments.

The first experiments were carried out on test samples. Setting sample tests were made of usual size with portland cement and ordinary tap water, containing one per cent, three per cent and ten per cent sugar solution, and directly after the samples are made up, they are placed in moist air, in ordinary air, in a chamber where air cannot get to them and in a moist carbon dioxide atmosphere.

Samples made with 1 and 3 per cent of sugar solution and stored in dry room air did not have any fissures in contradistinction to the sample made with ordinary tap water. A hard film, which cannot be scratched by the finger nail was formed on the upper surface in a thickness of about 0.3 millimeter. On the other hand the center and the under-side of the samples were easily scratched and friable.

When the samples were stored in air containing a small amount of moisture (also a little carbon dioxide), the surface and the interior of the samples remained friable at the beginning. When 1 per cent sugar solution was used in making the samples, they were found to be so hard that they rung when struck, this at the end of two months. This condition appeared first after ten months when a 3 per cent sugar solution was employed in making the samples.

When the samples were stored in a moist carbon dioxide atmosphere, a hard film, approximately 0.6 millimeter thick, formed on the upper surface. This film is partially lifted off the surface of the sample by the expansion of the substance lying underneath. The samples were also friable just like the others. When the fresh fracture of the sample is exposed to the action of moist carbon dioxide, then within one to two days, the surface becomes just as solid as the upper surface of the sample.

The same phenomena were observed when the ten per cent sugar solution was used. The only difference was that the samples developed fissures when exposed to the action of dry air. When samples first exposed to moist air, were dried in the room, then considerable shrinkage took place. The test samples were generally free from cracks. After the samples had been stored for ten months in moist air, they no longer possessed any strength at all.

An additional series of tests were made to supplement the first series and to afford an explanation of a number of questions relating to the microscopical examination. In order to answer the question as to whether or not the dissolving out of the lime is the sole cause of the faulty hardening of the cement, calcium saccharate was also used for making up the cement samples.

Microscopic investigations were first carried out on thin sections. These were prepared from the samples made with the first cement. Due to the friability of most of the test sample, it was necessary to use Canada balsam in preparing the slides. The first examination under the microscope of samples which were prepared in this manner taught the observer that there was nothing of any special importance that could be learned about the cement in this way. The sections were much too thick in comparison with the objects to be observed. The petrograph requires sections which are thinner than the individual crystals that are to

*A Contribution from the Governmental Testing Laboratories, Berlin-Dahlem.—From *Zement*, 1929.

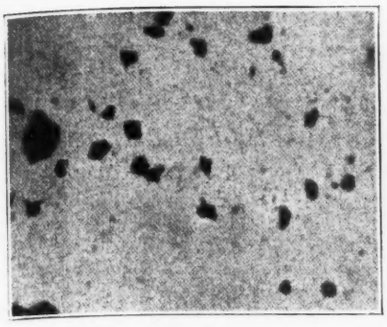


Fig. 1. Cement with 5 per cent sugar solution, after 2 days

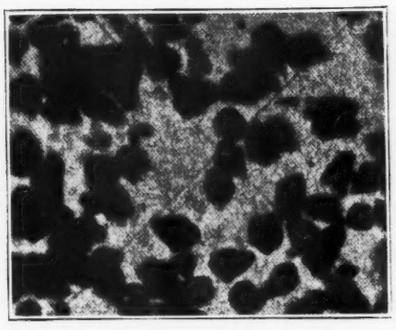


Fig. 2. Cement with 10 per cent. sugar solution, after 3 days

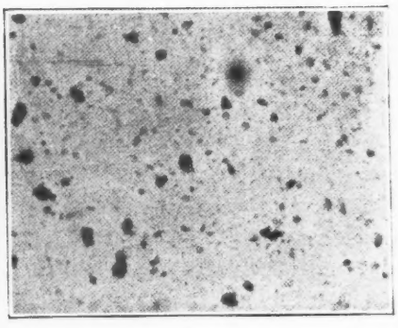


Fig. 3. Portland cement with lime, saturated. One per cent sugar solution, after 3 days

be examined. Cement clinker in the pulverized state, however, contains approximately 40 per cent of particles, whose diameter is smaller than the thinnest section prepared from cement (approximately 20 mu.). It is clear that the setting products likewise attain only a minimum magnitude due to the dense arrangement of the particles in the cement mixture, so that their growth is impaired.

The picture that is obtained when a thin section of a cement sample made up with sugar solutions is examined under a microscope is essentially different than the above. The strongly double refractive small crystallites are completely absent. Larger or other kinds of crystals, to which the shrinkage of the samples might possibly be assigned, were not observed. Only the undecomposed clinker ingredients are made lighter in color when observed through the crossed Nichols prisms, while the ground remained dark. This is an indication that the normal formation of crystals has been at least strongly retarded in this instance. The clinker particles appear to be sharper in outline than in the normal case, and consequently less hydrated. As far as the samples stored in carbon dioxide are concerned, the picture of the non-hardened interior is the same. Only the hardened surface layer shows a crystalline structure which is due to the formation of calcium carbonate. This is just like the appearance of the surface layer of a normal sample which has been kept in an atmosphere of carbon dioxide.

The progress of the setting of portland cement and the formation of the new compounds during this phenomenon have been clearly and somewhat accurately observed with the aid of pulverized samples of cement by a dyeing process. First thin needles of calcium hydrosilicate were formed, then thin six-sided plates of calcium hydroaluminate, hexagonal plates and prisms of calcium silicate gel.

In as much as the finest particles of the pulverized clinker make the observations difficult, it is advisable to separate them. Some investigators have, accordingly, used only a fraction of the screenings for these experiments. However, very large particles are obtained in this manner which enter more slowly into the reaction, and comparatively thick preparations are formed, which render difficult the use of high magnifications. The author, therefore, used for the preparation of the pulverized samples separated fractions from the cement of 20 to 30 mu. in size or perhaps from 40 to 50 mu. The micro-photographs obtained showed very clearly the intermingled needles of calcium silicate, the hexagonal plates of calcium hydrate, the prismatic crystals of calcium hydroxide and the numerous thin small plates of calciumaluminate surrounding the clinker particles as well as the formation of gel. The drops of gel are often observed on the crystalline needles or they surround these. Larger gel particles are also found in an agglomerated state here and there throughout the mass. After months of observation double refraction was observed in these gel particles, which indicated that crystallization has commenced in the gel mass. This observation forms a substantiation of the fact that the hardening of the portland cement after months and years have passed should be assigned to the crystallization of the gel contained in it.

The process is quite different when the cement samples were made up with sugar solutions. When a 1 per cent sugar solution was employed for this purpose numerous rod-like structures were observed after two hours floating around free in the solution, which resemble the crystalline needles which are formed during the normal setting process but which are not identical with them due to the lesser amount of double refraction and other characteristics of the sample. When a 1 per cent sugar solution is used for making up the cement samples, numerous rod-like structures are seen floating around free after two hours. The solutions obtained possess a lower coefficient of refraction and other properties than the crystalline needles which appear during the normal setting process. Hence they are not identical with the latter. Gel droplets appear after several days.

The same phenomena are observed with a 3 per cent and a 5 per cent sugar solution. The formation of gel is faster than in water. When a 5 per cent sugar solution is used, the particles of clinker were observed after one month to be completely surrounded with a gel film. The entire field of vision of the gel droplets was entirely filled up in the case of a 1 per cent sugar solution after a period of three months had elapsed. Very considerable formation of gel was observed in the case of a 10 per cent sugar solution after three days, without any previous or simultaneous formation of new crystalline structures.

The following important conclusions have been drawn from the observations made on the pulverized samples of portland cement. When sugar solution is employed for making up the samples, the crystalline formations, which take place at the outset at low concentrations, are different in characteristics and in quantity from those that are obtained with water alone. The formation of gel is considerably greater than when water is used and it sets in earlier at high concentrations. This conclusion agrees with the manner in which the afore-described investigations were carried out. Large numbers of small crystals, surrounding the particles of clinker were found in the thin sections of normally made-up cement, while they were, on the other hand, only few in number or not present at all when the cement was made up with sugar solutions in the same concentration. The microscope has served well to explain the phenomena which take place in the test samples themselves. Separation of lime took place when the samples, which were made up with 10 per cent sugar solution, were kept under water, and when the samples were dried at first in a moist atmosphere, they shrunk. The preponderant formation of gel, as revealed by the microscopic tests, explained this. The gel swells up in water and destroys the coherence of the cement mass, while it shrinks on drying, whereby it lends the sample a certain amount of strength, acting as an amorphous binding agent. The fact that test samples, which were prepared with low concentrations of sugar solutions, attained the strength of normal samples of mortar after a long period of time (for example one year) must be assigned to the gradual crystallization processes which take place in the gel.

It must also be mentioned that cracks occurred after a long time in a large number of glass plates which serves as the base for holding samples kept under water or in moist air. This took place in the case of samples which were prepared with 1 per cent sugar solution or 1 per cent sugar solution containing lime. These samples stuck fast to the glass plates. Cracks in these plates have not been observed under normal conditions in the government testing laboratories. It can, therefore, be concluded therefrom that samples, made up with the mentioned solutions, undergo a greater increase in volume when kept in a moist place than those made with ordinary water. This is unquestionably due to the established increased formation of gel. The increase in the strength, which is caused by the addition of a small amount of sugar, a phenomenon which has been observed by various investigators, must likewise be assigned to a more favorable state of the ratio of the crystalline to the colloidal products of setting due to the somewhat greater formation of gel. Considerable sweating was observed during the setting of samples which were kept in an atmosphere of carbon dioxide. This apparently is due to the fact that the gel, which was formed at the beginning in the surface film of the sample, was decomposed by the carbon dioxide with the formation of calcium carbonate, and the water contained in the gel was accordingly set free.

A film is formed on the surface of the samples due to the twenty-four hour storage in moist air, a procedure which was carried out in each case after the samples had been made up. This film becomes fixed to the samples due to the influence of the carbon dioxide in the atmosphere and cannot expand and contract with the shrinkage and expansion which take place in the samples. This explains the different curving effects which are produced in the samples by the contraction and the separation of the lime, leading to expansion. The thickness of this hardened film is of importance in this connection. The surface is caused to flake in the cases where the samples, which are first kept in a moist atmosphere, shrink. On the other hand the surface of samples, which are kept in a moist carbon dioxide atmosphere, remain uninjured, the samples do not warp, but large cracks are formed on the bottom.

The experiments, which were carried out with lime-containing sugar solutions, show that the disturbances in setting which are caused by the sugar solutions are assignable not only to the solution of lime, but particularly to the retardation and the influence exerted on the normal setting process, which is especially due to the increased gel.

## Three Forks Trident Plant

(*Continued from page* 43)

ton storage bin or sent directly through the mill. Two 4 by 30 Cummer dryers reduce the moisture in the coal from about 12 per cent to less than 3 per cent. The coal is ground in 2 stages. It is first reduced in two 42-in. Fuller mills; and finally ground in a 7½ by 11 F. L. Smidth tube mill with 1¼-in. balls.

Electric power is purchased from the Montana Power Company, a good customer of the cement company. Water is pumped from a shallow well.

# Some Observations on Accelerated Soundness Tests*

By A. T. GOLDBECK
Director, Bureau of Engineering, National Crushed Stone Association

IT is a matter of common observation that all construction materials undergo change when they are subjected to the elements. Some of them weather at an extremely rapid rate, others so slowly that a long period of years is required to bring about a noticeable alteration, but the ultimate action of severe weather exposure is inevitable. This phenomenon of weathering due to the physical and chemical effects of exposure is of vital interest to those concerned with the use of structural materials.

Some structures typified by monumental buildings are constructed with the idea that they will stand for centuries; others are known to have a comparatively short life due to a number of causes other than their resistance to the weather. Thus, large office buildings become obsolescent within a comparatively few years. Their life is controlled by economic considerations. Highways have an even shorter period. They are subjected to extremely severe weather conditions but their resistance to traffic may be the predominating factor which controls their life.

A. T. Goldbeck

Before a structure is built, full thought should be given to the ability of its component parts to withstand the particular conditions of exposure to which it will be subjected. Very frequently its weather resistance is a far more important consideration than its ability to carry the required loads, however important this may be. Not many years ago the importance of weather resistance was not as fully recognized as it is today and many unsuitable materials have been placed in use which have greatly lessened the life of expensive structures.

The ability of different types of rocks to withstand the weather is imperfectly understood by the engineer and in view of the importance of this subject it is thought well to publish the results of recent preliminary investigations made in the laboratory of the National Crushed Stone Association. It would be highly desirable if it might be reasonably well predicted whether a proposed construction material will be sufficiently resistant to the weather conditions to which it will be subjected. It is not always feasible to compare a proposed material with a similar material whose resistance is known although the petrographer has made important steps forward in this respect and by making a petrographic analysis he is now able to detect certain unstable minerals which disintegrate rapidly when exposed to the weather. Obviously, the engineer cannot wait for a long period of years to expose his proposed construction materials to weathering to see how they will behave and for this reason several different types of laboratory tests have been devised whose purpose is to simulate the action of the elements with greatly increased destructive effect.

It is commonly observed that the greatest enemy to the life of rock structure is frost action and although there are other destructive effects to which structures are at times submitted, their ability to resist frost is by far the most important and the accelerated tests which have been devised are aimed to imitate the disintegrating action of ice. The present paper deals with this particular form of accelerated soundness test.

Ice occupies a volume approximately 11 per cent greater than the volume of water and consequently when water freezes within the pores of the rock an expanding force is exerted which produces internal stress. If this stress exceeds the strength of the rock, failure takes place and the result is a gradual

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scaling off of the surface or at times a splitting action which tends to break it into smaller pieces.

## The Sodium Sulphate Soundness Test

When different kinds of salts crystallize from solution in the pores of rock they also exert an expanding action not unlike that produced by the growth of ice crystals and consequently an accelerated test has been devised making use of the expansive force of sodium sulphate crystals. The so-called sodium sulphate accelerated soundness test as described in Bulletin 1216 of the U. S. Department of Agriculture entitled, "Tenative Standard Methods of Sampling and Testing Highway Materials" reads as follows:

Method of Test for Soundness of Coarse Aggregate

1. Immerse 10 small pieces (total weight about 1,000 grams) of the rock in a saturated solution at 70 deg. F. of sodium sulphate ($Na_2SO_4$) for 20 hours, after which place them for 4 hours in a drying oven maintained at 100 deg. C. Repeat the treatment——times. The operation of immersing, heating, re-immersing, etc., shall be continuous. Note the condition of the rock as to soundness at the end of the test.
2. Samples which exhibit marked disintegration shall be considered to have failed in this test.*

Apparently, the interpretation of the above description by various testing laboratories has not been uniform and as a consequence variable results have been obtained on samples of the same variety of rock. Depending upon the method of conducting the tests either different forms or different amounts of sodium sulphate crystals may result and it is to be expected that because of these variable formations different expansive effects will likewise be produced.

Sodium sulphate crystallizes into three common forms, $Na_2SO_4$, $Na_2SO_4 \cdot 7H_2O$ and $Na_2SO_4 \cdot 10H_2O$ and probably there are still other forms which may depend upon a number of variables in the method of conducting the test.

Among these possible variables are:

(a) Temperature of solution when saturated.
(b) Temperature of solution in conducting the test.
(c) Temperature of the air.
(d) Humidity of the air.
(e) Temperature of the oven when the specimen is first placed in it for drying and perhaps other more or less important variables which tend to increase the amount of crystallization or change the form of crystallization.

To study some of the possible variables in the method, a number of different variations of the sodium sulphate test were employed on a sample of rock which previous investigations showed to be unsound when exposed to this test. The rock in question is a marble containing layers of interlocking calcite crystals. The variations used in the 8 different test methods are most simply shown in Table I.

It will be seen that the variables include the temperature at which the solution was saturated, the temperature of the solution at the time of immersion, the presence or absence of sodium sulphate crystals in the solution, temperature of the solution during the time of immersion, control of the extent of evaporation by covering or uncovering the pans containing the solution and the temperature of the rock when immersed in the solution. The effect of these different methods of test on the sample of marble is shown in Table II.

TABLE I

| Test No. | Temperature of Solution at Immersion Degrees Fahrenheit | Presence of Crystals in Solution before Immersion of Sample | Pans Covered or Uncovered | Temperature Condition of Rock when Immersed |
|---|---|---|---|---|
| 1 | 90° Sol. Sat. at 90° | No excess crystals | uncovered | hot |
| 2 | 70° " " " 70° | No excess crystals | " temp 60° | hot |
| 3 | 70° " " " 70° | No excess crystals | uncovered | cool |
| 4 | 70° " " " 70° | No excess crystals | * " temp. 80° | hot |
| 5 | 70° " " " 70° | Excess crystals | covered | hot |
| 6 | 70° " " " 70° | Excess crystals | uncovered | hot |
| 7 | 70° " " " 70° | No excess crystals | covered | hot |
| 8 | 70° " " " 70° | No excess crystals | uncovered | hot |

* Pan placed in moist atmosphere.

Ten pieces of rock were used in each test listed in the above table and the tabulation shows the number of pieces which remained unaffected and the number which failed completely. Those pieces which showed incipient failure are not indicated. A study of the table will reveal that the different test methods exerted different effects and that one method might reject the sample whereas another method might accept it. Thus, at the end of 5 cycles, the number most generally used for highway aggregates, a wide difference in the effects of various forms of tests is evidenced by the wide range in number of sound pieces remaining at the end of this number of cycles.

Photographs of the specimens after ten cycles of the sodium sulphate test conducted in the foregoing 8 different ways are shown in Figures 2A to 2D inclusive and a close study will show the bad state of disintegration of the rock when tested by method 3. A study of the photographs, Figures 1A to 1D showing the different forms of crystallization resulting from the above 8 different test methods is interesting in demonstrating that the extent of growth and size of individual crystals, and likewise their shape, vary considerably.

* A correct interpretation of the results of the sodium-sulphate soundness test will be greatly assisted by a visual examination of the ledge from which the sample was obtained. Failure in the test, when accompanied by evidence of weathering of the exposed surface, may be considered sufficient ground for rejection.

It would not be safe to draw conclusions from the results of so few tests conducted on a single sample of rock but one thing is surely outstanding, namely, that the different methods of conducting the tests do result in a difference in crystallization and they do result in different degrees of disintegration. It must be quite apparent that unless all testing laboratories conduct the test in a given way, different results will be obtained and the results will not be truly indicative of the value of the rock for structural purposes even granting that the sodium sulphate test can be accepted as indicative of probable service behavior, and as will be shown later there is some doubt as to this.

TABLE II
Results of Sodium Sulphate Test Conducted in Eight Different Ways

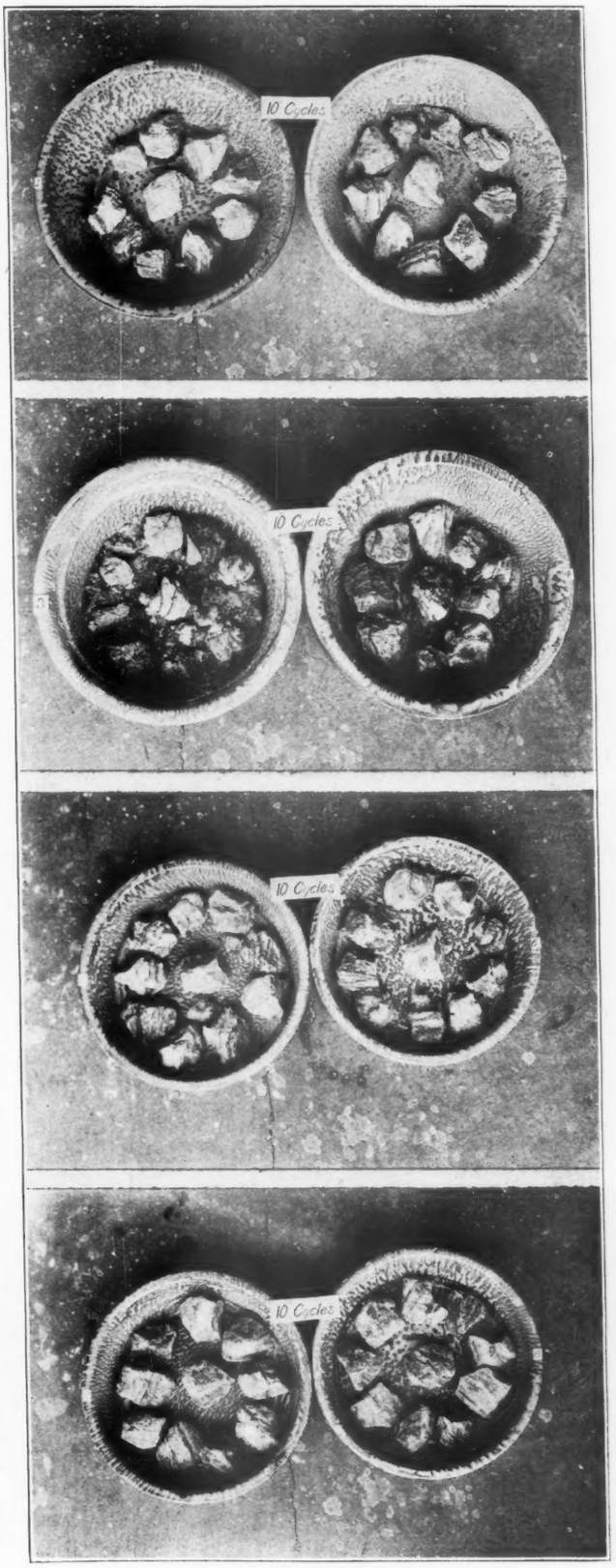
| Number of Alternations | Test Numbers | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | |
| | OK | F | OK | F | OK | F | OK | F | OK | F | OK | F | OK | F | OK | F |
| 1 | 10 | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 | 0 |
| 2 | 10 | 0 | 10 | 0 | 10 | 0 | 8 | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 | 0 |
| 3 | 10 | 0 | 8 | 0 | 7 | 0 | 8 | 0 | 9 | 0 | 9 | 0 | 9 | 0 | 10 | 0 |
| 4 | 10 | 0 | 7 | 0 | 6 | 0 | 8 | 0 | 9 | 0 | 5 | 0 | 9 | 0 | 10 | 0 |
| 5 | 8 | 0 | 3 | 0 | 3 | 0 | 4 | 0 | 4 | 0 | 2 | 0 | 7 | 0 | 5 | 0 |
| 6 | 8 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 7 | 8 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 8 | 6 | 0 | 0 | 0 | 0 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 4 | 0 | 0 | 0 | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 4 | 0 | 0 | 0 | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 3 | 0 | 0 | 1 | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 3 | 0 | 0 | 1 | 0 | 5 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 13 | 3 | 1 | 0 | 3 | 0 | 6 | 1 | 2 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | 0 |
| 14 | 3 | 2 | 0 | 4 | 0 | 8 | 1 | 4 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 |
| 15 | 3 | 2 | 0 | 4 | 0 | 8 | 0 | 4 | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 |
| 16 | 3 | 3 | 0 | 5 | 0 | 8 | 0 | 4 | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 |
| 17 | 2 | 3 | 0 | 5 | 0 | 8 | 0 | 4 | 0 | 6 | 0 | 5 | 0 | 0 | 0 | 2 |
| 18 | 1 | 3 | 0 | 5 | 0 | 8 | 0 | 4 | 0 | 6 | 0 | 5 | 0 | 0 | 0 | 2 |
| 19 | 1 | 7 | 0 | 10 | 0 | 8 | 0 | 7 | 0 | 7 | 0 | 7 | 0 | 5 | 0 | 7 |
| 20 | 1 | 7 | 0 | 10 | 0 | 8 | 0 | 8 | 0 | 8 | 0 | 7 | 0 | 6 | 0 | 8 |

OK: unaffected by test. F: failure.
Note: 10 pieces used in each test. Pieces showing incipient failure are not noted in this table.

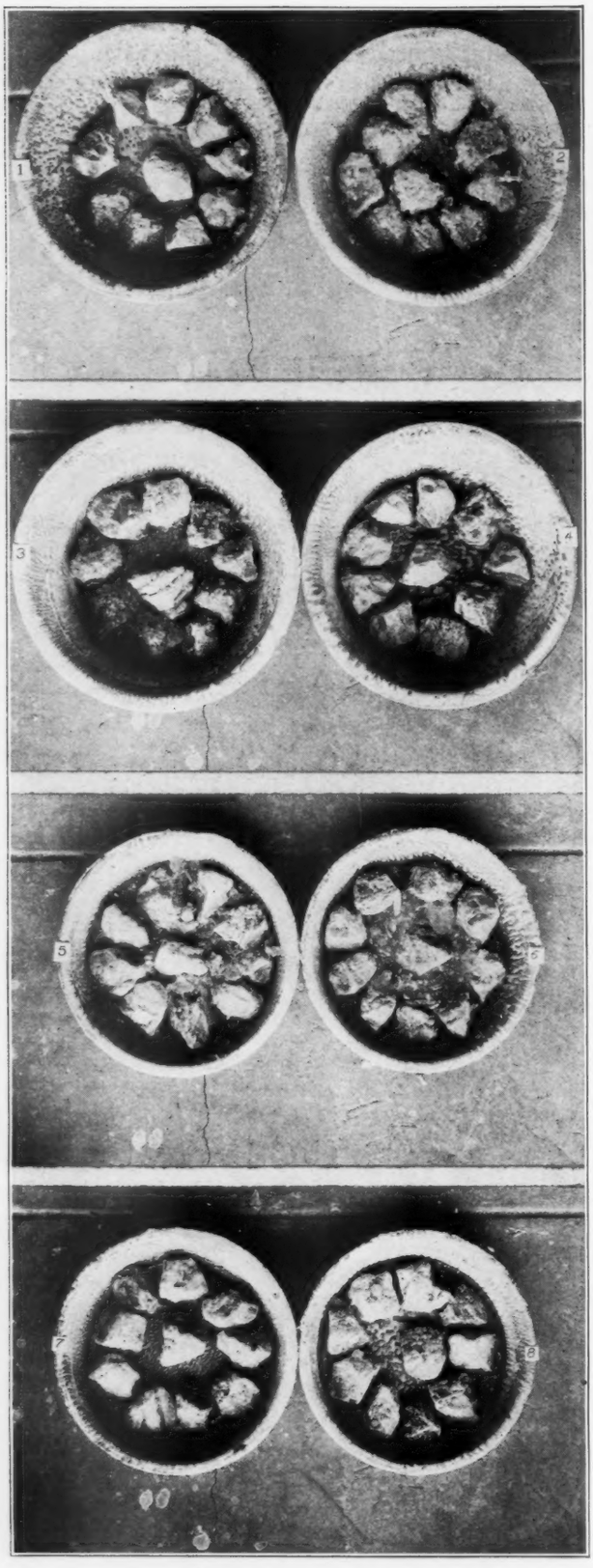
Evidently those factors which are known to control crystallization should be very carefully watched in conducting the sodium sulphate test.

1. The strength of the saturated solution should be uniform; and the solution should be saturated when the temperature is as close to 70 deg. F. as practically possible.
2. The temperature of the solution during the time of immersion should be kept constantly at 70 deg., for if the temperature is allowed to fall below this in variable amounts there will be variable amounts of crystallization.
3. Evaporation of the solution should be prevented. The higher the evaporation, the more concentrated will become the solution and the more extensive will be the crystallization.
4. The temperature of the rock at the time of immersion of the specimen should be controlled, preferably by cooling it down to room temperature and finally,
5. The oven should be preheated to the required temperature before placing the specimens in it for drying.

In brief, the present description of the method of making the sodium sulphate test is far from adequate and is in need of revision so that each operation will be described in rather complete detail.




Figs. 1A to 1D
**Illustrating variable crystallization of sodium sulphate due to variations in method of conducting sodium sulphate test**



**Figs. 2A to 2D**

**Variable effects of sodium sulphate test conducted on same sample of rock using different test methods, producing crystallization shown in Figs. 1A to 1D**

Merely as a suggestion of a more detailed test procedure which probably does not completely eliminate all of the difficulties of this test the following description is given.

## Suggested Test Procedure, Sodium Sulphate Test

Select not less than 8 pieces of the material, each piece weighing approximately 100 grams. Dry the sample at 100° to 105° C. for 4 hours. After cooling weigh and identify each piece by number, recording the weights of the individual pieces as well as the total.

Immerse the dry, weighed sample in a solution of sodium sulphate saturated at 70° F. (21.1° C.) contained in an agateware or other suitable container. The container shall be covered to prevent evaporation and the solution shall be maintained at a temperature of 70° to 75° F. while the sample is immersed in it. No free crystals shall be present initially.

Keep the sample immersed for a period of 18 or 19 hours after which remove it and *immediately place* it in a shallow pan.

*Immediately place* the pan in an oven which has been preheated to a temperature of 100° to 105° C.; maintain the oven at that temperature for 4 hours after which period the sample shall be removed and allowed to cool over a period of 1 to 2 hours to air temperature.

Examine each piece for fracture and incipient cracks and record its condition.

At the end of the cooling period re-immerse the sample in the sodium sulphate solution.

One immersion and one period of drying and cooling constitutes a cycle.

Repeat the above treatment through the required number of cycles, or until obvious failure where the identity of the individual piece is lost.

At the end of the required number of cycles wash the material thoroughly, boiling if necessary, to remove all contained sodium sulphate and save all fines. Dry and weigh each piece as circumstances will permit, record the weight of all material over 1 inch in size and calculate the loss of material ¼ inch in size.

*Failure:* Pieces of material which exhibit disintegration, marked checking or cracking or are so cracked that it is evident that they will do so shall be considered as having failed in the test. It is suggested that the sample be considered to have failed when it has lost a selected percentage of the original weight of the sample at the end of 5, 10 or more alternations. Obviously, the severity of the exposure will warrant a different set of limits for per cent of loss in different localities and these limits will have to be determined by comparison with the behavior of the material in service. For highway work 5 alternations of the sodium sulphate test is generally sufficiently severe.

(Note: If for any reason the continuity of the testing must be interrupted, as for example over week-ends, the sample should remain in the solution.)

## Freezing Tests

Recognizing the unsatisfactory status of the sodium sulphate test as now conducted and further realizing the possibility of utilizing the accelerated freezing test as a means for determining the weather resisting properties of rock, efforts have been directed in the laboratory of the National Crushed Stone Association to the development of a rapid form of freezing test. The freezing apparatus (Figure 3) consists of a six-compartment freezing cabinet connected with a one-half horse power compressor. Each compartment is 20 inches deep and 10 inches in diameter. With this apparatus temperatures as low as 14 deg. below Zero F. are possible. The method of conducting the freezing test is as follows:

Specimens of stone approximately 1½ inches in diameter are prepared with the use of a hammer and these pieces are immersed to half their depth in a pan of water. When a number of tests are made on different samples the pans containing the specimens are stacked one on top of the other and are placed in a galvanized iron container which fits in the compartment of the freezing apparatus. To effect rapid freezing, the space between the galvanized can and the sides of the compartment is filled with alcohol. The test is conducted by freezing the specimens for a period of 16 hours. They are then thawed during the day over a period of 8 hours and the process is repeated. Each piece of stone is given an individual number and record is made of the conditions of the sample at frequent intervals. In figures 4A to 4D are shown the results of 20 freezing tests on a number of samples of rock and Portland cement mortars. Figures 4E to 4H show the condition of these samples after 50 alterations. Some of these are sound and some show signs of unsoundness. It is, of course, impossible to state definitely how many alternations of freezing in this form of test are equivalent to a given number of alternations in service. Unquestionably this test is very severe, for freezing takes place at the surface of the rock very shortly after it is placed in the freezing apparatus, and the rapidity of the freezing very likely has some effect on the severity of the test. In an effort to determine the relation between the freezing and thawing test and the sodium sulphate test, if such a relation exists, comparative tests were made on specimens from identical samples of rock and these results are tabulated in table No. III and the effects of the sodium sulphate tests after 10 and 20 alternations are shown in Figures 5A to 5D and 5E to 5H.

## Comparison of Sodium Sulphate and Freezing Tests

A comparison has been made after 50 alternations of freezing and thawing and 20 alternations in the sodium sulphate test and the results are

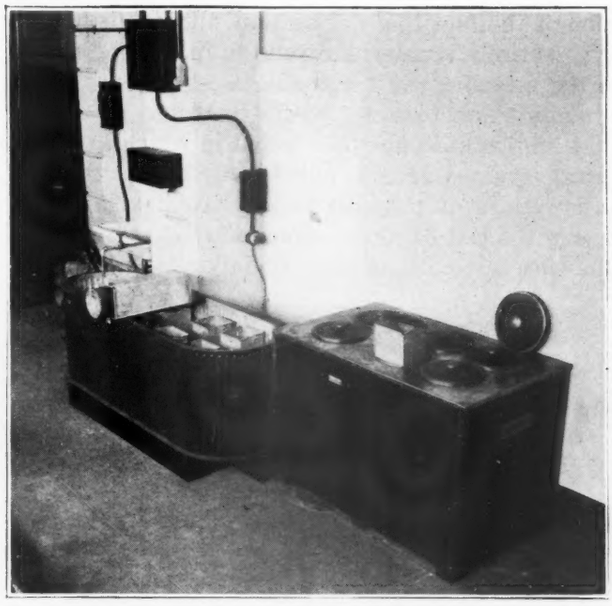


**Fig. 3—Freezing Apparatus**

expressed in terms of percentage of loss of the various materials. There is no very good relation observable between the two tests. In 9 cases freezing and thawing had caused more disintegration than the sodium sulphate test and there are 4 cases in which the sodium sulphate test has caused more loss than freezing and thawing.

TABLE III
Relation of Freezing and Thawing Test and Sodium Sulphate Test

| Sample No. | Per Cent Loss | |
|---|---|---|
| | Freezing 50 Cycles | Sodium Sulphate 20 Cycles |
| 2 | 6 | 38 |
| 5 | 0 | 0 |
| 7 | 30 | 25 |
| 9 | 0 | 85 |
| 13 | 7 | 18 |
| 23 | 0 | 0 |
| 27 | 0 | 0 |
| 32 | 0 | 0 |
| 35 | 31 | 5 |
| 17 | 0 | 0 |
| 24 | 13 | 4 |
| 31 | 0 | 0 |
| I | 0 | 0 |
| II | 34 | 0 |
| III | 100 | 44 |
| IV | 71 | 40 |
| V | 6 | 0 |
| VI | 100 | 19 |
| VII | 27 | 2 |
| 51 | 0 | 2 |

Note: Samples I to VII are Portland cement mortars and the remaining samples are stone and gravel.

On samples Nos. 9 and 51 the freezing test had no appreciable effect whereas the sodium sulphate test had considerable effect on sample No. 9 and little effect on No. 51. Sample No. 9 which showed very bad disintegration in the sodium sulphate test and no disintegration whatever in the freezing and thawing test is a marble and is a typical illustra-

tion of the fact that the sodium sulphate test may give entirely erroneous results in indicating a rock to be unsound when actually it is entirely sound and quite able to resist severe freezing.

A similar case has been noted in which a rather coarse grained granite failed badly in less than 10 alternations of the sodium sulphate test and yet has withstood 65 alternations of the freezing and thawing test with no signs of failure whatever.

The freezing and thawing test just described gives promise of being an exceedingly convenient laboratory test for the soundness of rock and other aggregates and it can be performed almost as rapidly as the sodium sulphate test, provided the period of alternation is reduced. It is quite possible to obtain at least 2 alternations per day, and perhaps more.

**Figs. 4A to 4D—20 Cycles** **Figs. 4E to 4H—50 Cycles**
**Effect of freezing and thawing test on different samples of rock and Portland cement mortar**

## Freezing Tests on Mortars

When failure occurs in concrete under the action of the weather the question arises as to whether the defect is attributable to the coarse aggregate or to the mortar portion of the concrete. In order to obtain some idea of the relative resistance of mortars of varying degrees of richness and varying water ratios, freezing tests were conducted on mortars as well as on coarse aggregates. For the purpose of direct comparison with the mortar, a stone was selected which has been thought by some engineers to be the cause of defective concrete roads. This stone is a siliceous limestone and somewhat resembles other cherty limestones which are known to be troublesome. Some of them are decidedly unsound and others show no signs of unsoundness. The mortar specimens for the present investigation were prepared by breaking pieces from the broken ends of mortar test beams. These beams were prepared from Portland cement passing the standard specifications and from Potomac River sand having the following mechanical analysis.

Mechanical Analysis of Sand

| Passing Sieve No. | Retained Sieve No. | Per Cent |
|---|---|---|
| 4 | 4 | 1 |
| 4 | 8 | 8 |
| 8 | 16 | 10 |
| 16 | 30 | 20 |
| 30 | 50 | 36 |
| 50 | 100 | 19 |
| 100 | 200 | 2.4 |
| | Passing 200 | 2.5 |
| | Total | 99.9 |

Fineness Modulus—2.37

The quantities used in the mortar mixtures were as follows:

TABLE IV
Quantities of Materials Used in Mortar Tests

| No. | Mix by Wt. | Cement Lbs. | Sand Lbs. | Water Lbs. | Flow (½ in. drop) | W/C | Combined Water Lbs. (Estimated) | Free Water Lbs. (Estimated) |
|---|---|---|---|---|---|---|---|---|
| I | 1:1 | 55.0 | 55.0 | 19.4 | 163 | 0.53 | 6.9 | 12.5 |
| II | 1:2 | 36.6 | 73.2 | 21.6 | 165 | 0.89 | 5.1 | 16.5 |
| III | 1:3 | 27.5 | 82.5 | 22.2 | 176 | 1.22 | 4.8 | 17.4 |
| IV | 1:4 | 22.0 | 88.0 | 22.9 | 164 | 1.57 | 4.2 | 17.7 |
| V | 1:2 | 36.6 | 73.2 | 19.2 | 169 | 0.79 | 5.1 | 14.1 |
| VI | 1:2 | 36.6 | 73.2 | 29.0 | 300+ | 1.19 | 5.1 | 23.9 |
| VII | 1:2 | 36.6 | 73.2 | 23.3 | 205 | 0.96 | 5.1 | 17.2 |

The specimens were cured in the moist room at 70 deg. for a period of 27 days. They were broken as simple beams on 20-inch span with the following resulting values for modulus of rupture.

In table IV are shown the quantities of cement, sand and water in the mixture and also the quantity of so-called free water is indicated. This was estimated by assuming that the same percentages

Modulus of Rupture of Mortars Used in Freezing Tests

| No. | Modulus of Rupture (Lbs. per Sq. In.) | No. | Modulus of Rupture (Lbs. per Sq. In.) |
|---|---|---|---|
| I | 1044 | IV | 338 |
| II | 656 | V | 780 |
| III | 491 | VI | 546 |
| | | VII | 660 |

of free water existed as determined by F. H. MacMillan and indicated by him in a recent report. (See Report of the Director of Research, November, 1928, Portland Cement Association.) It seems to be indicated at least that the extent of the disintegration has some relation with the amount of free water present and bears a better relation with this quantity than with the water-cement ratio.

A coarse aggregate would have to be of very poor quality to be as little resistant as these particular mortars and stone No. 51 hitherto under suspicion is very much more resistant than mortar —far richer than it is customary to use in concrete highway construction. The condition of these samples after 20 and 50 alternations of freezing and thawing is shown in Figures 4C, 4D, 5C and 5D respectively, samples I to VII inclusive.

Sodium sulphate tests were also made on samples of mortars broken from the same mortar beams from which the mortar freezing specimens were taken. The results of these tests after 10 and 20 cycles respectively are shown in Figures 5C and 5D and 5G and 5H. It is quite noticeable in the photographs that the effect on these mortar samples of 20 cycles of freezing is more severe than 20 cycles of the sodium sulphate test and this comparison shows how very severe this form of freezing test is. It may also give a clew as to how many cycles of this test or of the sodium sulphate test are required to be comparable with service conditions. Shales which are unsound have disintegrated after the second alternation of the freezing test. There is uncertainty as to how many cycles of either the freezing test or the sodium sulphate test an aggregate should withstand without failure, but the indications are that 10 cycles of freezing are sufficient to indicate unsoundness of a rock or lack of resistance of mortar to moderate freezing conditions. In general, 5 alternations of the sodium sulphate test are sufficiently severe except for abnormal cases of exposure, and as pointed out the results may reject a suitable material.

The preceding points are mentioned without any attempt at the present time to draw any conclusions but rather to indicate the trend of our investigations on accelerated soundness tests.

## Indications from Test Results

The following indications drawn from these tests which perhaps may be reversed after fuller investigation seem to be warranted at the present time.

1. That the sodium sulphate test as at present practiced cannot be relied upon to give identical results unless identical methods are used in conducting the tests. This explains why different laboratories may obtain different results.
2. The present description of the sodium sulphate test is not definite enough and should be written in greater detail.
3. The sodium sulphate test may reject material which has been shown to be entirely sound not only in practice but as proven by a severe form of freezing and thawing test.
4. The action of the sodium sulphate test on Portland cement mortars does not seem to be as severe as the action of the freezing and thawing test.
5. There is no distinct relation between the results of freezing and thawing tests and the sodium sulphate test. In some cases one is more severe than the other.
6. It is indicated that the freezing and thawing test promises to be a very convenient accelerated soundness test which has the advantage of subjecting the sample to freezing conditions obtaining in service but in a more

(*Continued on page 62*)

**Figs. 5A to 5D—10 Cycles** **Figs. 5E to 5H—20 Cycles**
**Effect of sodium sulphate test on same materials shown in Figs. 4A to 4H**

# Crushed Stone Associations Hold Joint Sessions

IT is obvious that Secretary A. S. Owens accomplished his desired result from his recent jocular announcement to Stone Crackers (see October 23 issue of PIT AND QUARRY for close to one hundred members of the Manufacturers Division of the National Crushed Stone Association, including numerous members of the Board of Directors of the National Crushed Stone Association, attended the annual meeting and dinner held on the roof garden of the Pennsylvania Hotel, New York, Friday evening, October 25.

Previous to this evening meeting, the New York State Crushed Stone Association held a meeting attended by some thirty members. At the morning luncheon of the State Association, members of the Board of the National Association were guests and the speakers were President W. F. Wise, of the National Association, Otho M. Graves, Treasurer F. T. Gucker, and A. L. Worthen.

In the absence of Ed. Lewis, H. M. Davison presided as chairman of the Manufacturers Division banquet. President Wise of the National Association was introduced and spoke briefly. Stating that the membership of the Manufacturers Division had been augmented this year until the membership stood at ninety-five out of a possible limit of one hundred active members, Mr. Wise praised the work of the Division. He urged strongly that, at the Annual Cincinnati Convention in January, 1930, equipment manufacturers send, in addition to salesmen, some of their technical men and engineers to learn more intimately the problems confronting the industry.

H. M. Davison
Presided at banquet

Past-president Otho M. Graves was then introduced and, in a reminiscent mood he recalled the early struggles of the Association. Then, acting as toastmaster for the evening, he introduced members of the Board of the National Association. Included among those who were called upon to say a few words were John Rice, E. J. Krause, F. T. Gucker, H. E. Bair and A. L. Worthen.

J. R. Boyd, secretary,
National Crushed Stone Association

Others introduced at the dinner were A. T. Goldbeck, director of the Bureau of Engineering of the Association; John Rice, Jr., and Gordon Buchanan of New York. A vote of thanks was given Mr. Buchanan for the unstinted effort rendered by Mr. Buchanan in making the local arrangements of the meeting a success.

The meeting adjourned with Secretary J. R. Boyd outlining plans for the January convention of the Association to be held at the Hotel Gibson, Cincinnati. Secretary Boyd announced that a committee on allocation would be appointed to designate exhibit spaces and that a Federal Trade Practice conference would be held the day after the close of the convention. Mr. Boyd declared the coming convention promised to be the biggest and best in history, and that details would be sent to members in printed form next week.

Following are names of those attending the banquet:

Allis-Chalmers Mfg. Co., Milwaukee, Wis.: G. W. Maisak, H. W. Erickson, W. C. MacEwen.

Atlas Powder Co., Wilmington, Del.: A. D. Hammond.

Earle C. Bacon, Inc., New York, N. Y.: S. F. Macpeak, W. H. Milroy, W. V. Pietach.

C. G. Buchanan Co., Inc., New York, N. Y.: Gordon Buchanan, G. W. Flounders, G. H. Keppel.

Bucyrus-Erie Co., Milwaukee, Wis.: R. W. Conant.

Cross Engineering Co., Carbondale, Pa.: N. S. Nicol.

Detachable Bit Corp. of America, New York, N. Y.: W. C. Rea, R. W. Sanders.

E. I. duPont de Nemours & Co., Wilmington, Del.: T. M. Garrett, J. A. Lang, S. R. Russell, E. I. Wolf.

Easton Car and Const. Co., Easton, Pa.: J. C. Farrell.

Frog, Switch and Mfg. Co.—Manganese Steel Forge Co., Philadelphia, Pa.: E. L. Pemberton.

Gardner-Denver Co., Denver, Colo.: C. E. Kaiser.

Gill Rock Drill Co., Lebanon, Pa.: Fred A. Gill.

Harnischfeger Sales Corp., Milwaukee, Wis.: H. M. Davison, Mr. Deephouse.

Hendrick Mfg. Co., Carbondale, Pa.: B. G. Dann.

Hercules Powder Co., Wilmington, Del.: S. A. Johnson.

Ingersoll-Rand Co., 11 Broadway, New York, N. Y.: A. A. Holland, E. H. Paull, J. M. Wells.

Kennedy-Van Saun Mfg. and Engr. Co., New York, N. Y.: C. A. Adams.

**H. E. Bair, France Stone Company, Toledo, Ohio**

Keystone Lubricating Co., Philadelphia, Pa.: Leo Englander, R. C. Smith.

Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill.: Wm. A. Schnell.

Loomis Machine Co., Tiffin, Ohio: J. Reynard.

Mack-International Motor Truck Corp., Philadelphia, Pa.: F. B. Barnitz, Earl B. Hill, W. B. Jupp, C. W. MacMillen, E. M. Post, Jr., H. L. Waehling, F. A. Warner.

Marion Steam Shovel Co., Marion, Ohio: R. S. Johnson, W. N. Westland.

McLanahan Stone Machine Co., Hollidaysburg, Pa.: A. H. McLanahan, Ward McLanahan.

Niagara Concrete Mixer Co., Buffalo, N. Y.: S. C. Hodge, F. J. Morrissen.

Nordberg Mfg. Co., Milwaukee, Wis.: L. D. Hudson.

PIT AND QUARRY, Chicago, Ill.: L. M. Weiss.

Robins Conveying Belt Co., New York, N. Y.: J. H. Robins, M. S. Lambert.

*Rock Products*, Chicago, Ill.: F. S. Peters, N. C. Rockwood, C. L. Walker.

Ross Screen and Feeder Co., New York, N. Y.: E. Webster.

Sanderson-Cyclone Drill Co., Orrville, Ohio: W. F. Nothacker.

Traylor Engr. & Mfg. Co., Allentown, Pa.: D. A. Cheyette.

Westinghouse Electric & Mfg. Co., New York, N. Y.: B. L. Clegg, C. C. Bawden.

The following officers of the association and members of the executive committee attended as guests of manufacturers' division:

W. F. Wise, president, Southwest Stone Co., Dallas, Tex.

F. T. Gucker, treasurer, John T. Dyer Quarry Co., Norristown, Pa.

J. R. Boyd, secretary, Washington, D. C.

A. T. Goldbeck, director, Bureau of Engineering, Washington, D. C.

H. E. Bair, The France Stone Co., Toledo, O.

O. M. Graves, The General Crushed Stone Co., Easton, Pa.

E. J. Krause, Columbia Quarry Co., St. Louis, Mo.

A. L. Worthen, Connecticut Quarries Co., Inc., New Haven, Conn.

The following members of the New York State Crushed Stone Association attended as guests of the manufacturers' division:

J. R. Callanan, Callanan Road Improvement Co., South Bethlehem, N. Y.

W. W. Duff, Lake Erie Limestone Co., Youngstown, O.

A. J. Hooker, Buffalo Crushed Stone Co., Buffalo, N. Y.

F. S. Jones, General Crushed Stone Co., Easton, Pa.

G. J. Murphy, General Crushed Stone Co., Little Falls, N. Y.

A. S. Owens, Eastern Rock Products, Inc., Schenectady, N. Y.

F. C. Owens, General Crushed Stone Co., Auburn, N. Y.

C. L. Petzel, New York Trap Rock Corp., 250 Park Ave., New York, N. Y.

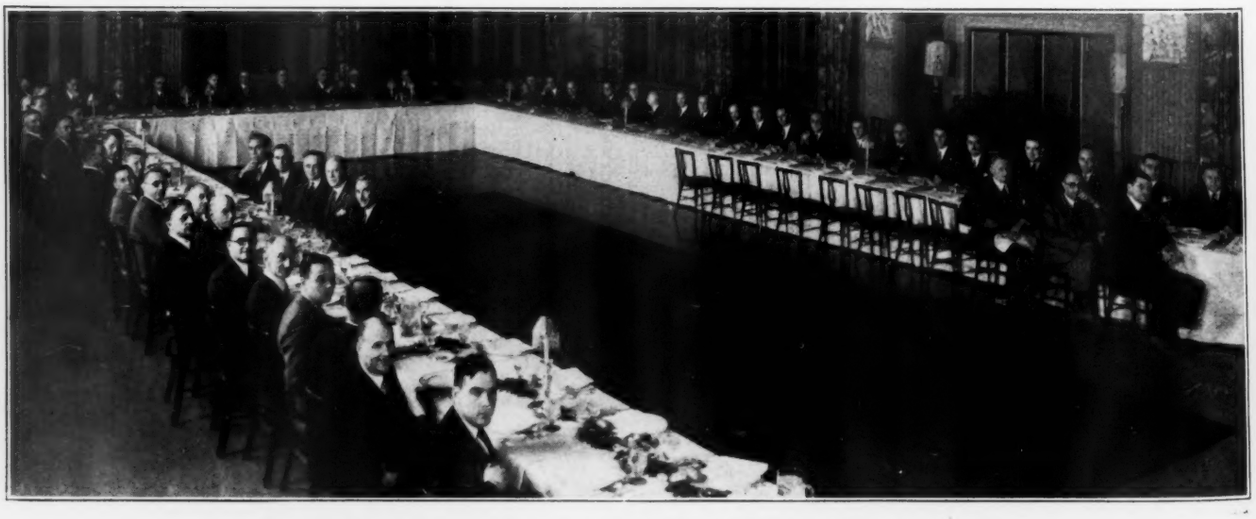
John Rice, General Crushed Stone Co., Easton, Pa.

John Rice, Jr., General Crushed Stone Co., Easton, Pa.

H. J. Russell, Jointa Lime Co., Glen Falls, N. Y.

A. G. Seitz, General Crushed Stone Co., Syracuse, N. Y.

G. E. Schaefer, General Crushed Stone Co., Rochester, N. Y.



**Banquet, Manufacturers Division of National Crushed Stone Association**
**Pennsylvania Hotel, New York, October 25, 1929**

# American Aggregates Operates Two Strictly Modern Plants at Oxford, Michigan

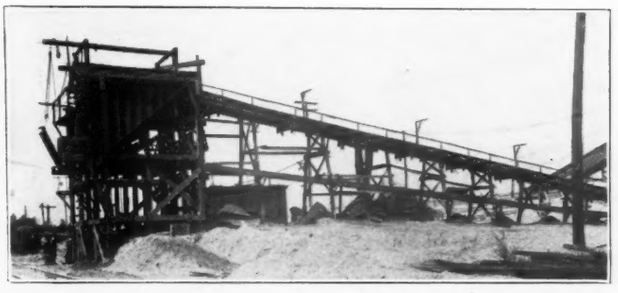
## Washed Materials in Storage Are Mixed Into Commercial Grades

By THOMAS L. COLLINS

AN EXTENSIVE deposit of sand and gravel of glacial origin extends along the west side of Oxford, Michigan, underlaying several thousand acres. One of the largest producers of sand and gravel in this territory is the Greenville Gravel Division of the American Aggregates Corporation. This concern has been operating here less than two years.

The company entered this section through the purchase of three plants: The United Fuel and Supply Company plant, now known as the Ray plant or Plant A, in December, 1927; the Fuller Becker Sand and Gravel Company, now known as the Fuller plant or Plant B in May, 1928; and the Detroit-Oxford Gravel and Stone Company, the smallest of the three plants, in 1928. The Detroit-Oxford was the first plant opened in this section and, at the time of the sale, was operated under lease by the Ray Sand and Gravel Company. It has been closed and its acreage has been reserved to be worked by Plant B.

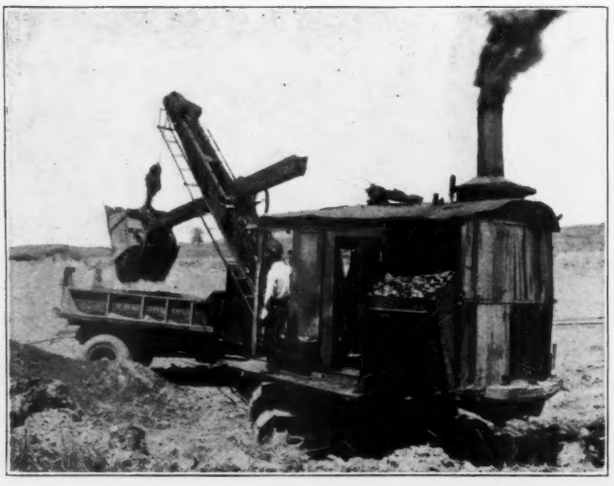
This merger was put through by the Greenville Gravel Corporation. On April 23, 1928, this company was merged with the American Aggregates Corporation and its name was then changed to the Greenville Gravel Division of the American Aggregates Corporation.



Loading tipple and conveyor from storage bins, plant B

The Ray plant or Plant A, the larger and more modern of the two being operated, is located a mile north of Oxford along the right of way of the Michigan Central railroad and has direct connection with the Grand Trunk railroad and the Eastern Michigan electric line. It is under the direction of T. D. Folkerth, plant superintendent. The company owns and has under lease, approximately 2,000 acres of which about 80 acres have been excavated and worked. The sand and gravel de-

Bins and tipple for loading freight cars and trucks, plant A



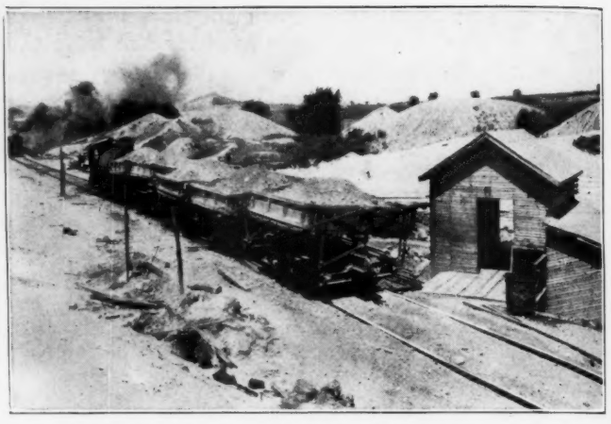
Stripping with steam shovel and truck, plant B

posit here averages about 60 ft. deep. It is about the same all the way through, except that occasionally there is a thin stratum in which the ratio of sand is slightly higher. According to last year's production figures, the gravel averaged around 62 per cent and the rest was sand, with a very small percentage of waste.

The overburden is approximately three feet deep. It is removed by a Class-24 Bucyrus steam dragline, mounted on a railroad track, with 100-ft. boom and a 4-cu. yd. bucket. On the hoist a $\frac{7}{8}$-in. Leschen cable, 430 ft. long, is used, and on the dragline a $1\frac{3}{8}$-in. Leschen cable, 170 ft. long. The ordinary method of discarding this overburden is to cast it into an old pit bottom after all the usable material has been removed.

At the present time, an excellent grade of sand and gravel is being taken from a pit recently opened in new territory north of the old pit. To reach it, a tunnel was built under a township highway. An old pit bottom is not available for the overburden here which is being piled on top of the bank at one side. When the new pit has been extended sufficiently, the old overburden will be cast over into it by the dragline.

In the pit a Marion model No. 60 steam shovel, with a $2\frac{1}{2}$-cu. yd. dipper and $1\frac{1}{4}$-in. hoisting chain, and a Bucyrus model 50B steam shovel with a 2-cu. yd. dipper and 1-in. Leschen cable are used. An Erie type B steam shovel is utilized for cleaning up and for odd jobs around the pit and storage piles, and for occasional stripping work, and a Browning locomotive crane equipped with a 2-cu. yd. bucket is available for cleaning up and for odd jobs around the plant.



Cars about to be unloaded at field hopper, plant B

General view of pit at plant B, American Aggregates Corporation

The material is hauled from the pit in seven steel ore-cars with bottom-dump made by the Standard Steel Car Company. The capacity of these cars is 50 tons. Motive power is furnished by two 40-ton Davenport locomotives.

These cars are dumped into an underground hopper from which the material is carried by two 36-in. rubber conveyor belts, each with 150-ft. centers. One of these belts is a Goodall, operated by a 50-hp. Allis-Chalmers motor, while the other is a Manhattan, operated by a 50-hp. General Electric motor with Texrope drive. Both of these motors are equipped with slip rings.

The material is first carried to dry scalping screens where the belt discharges into two 60-in.

Steam dragline removing overburden, plant A

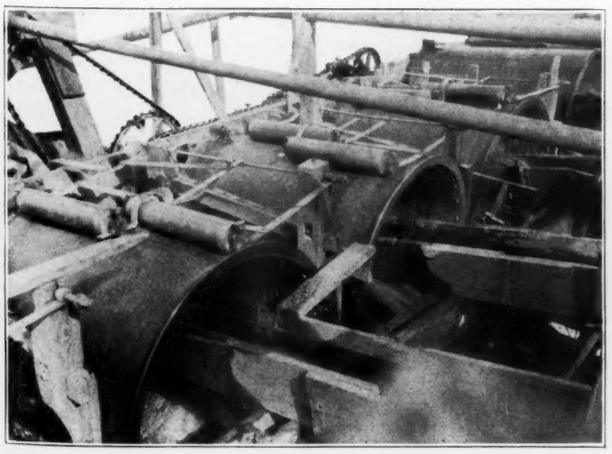
single-jacketed revolving screens, 12 ft. long between trunnions and with a 7-ft. overhang, built by the Greenville Manufacturing Works. These screens are operated by a 50-hp. General Electric motor with Texrope dual drive.

At the hopper, grizzly bars catch the 8-in. stone and larger. These are picked off the bars by hand and dumped into an 18-in. by 36-in. Allis-Chalmers Blake jaw crusher which reduces the stone to 4 in. and smaller. It is operated by a 100-hp. General Electric motor with Texrope drive.

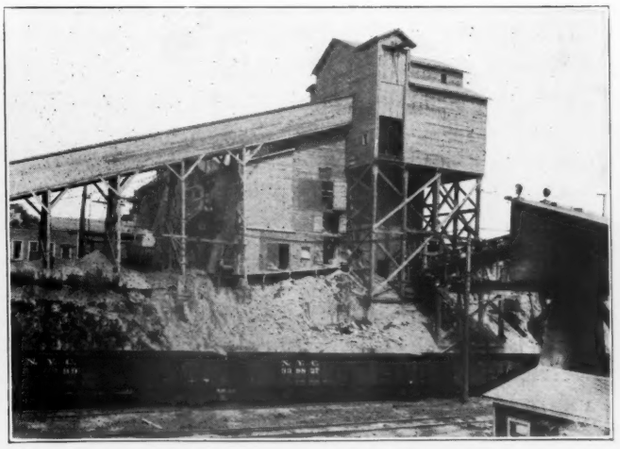
From the scalping screens the gravel and sand passing through the 2-in. openings goes to a small

Vibrating and washing screen, plant A

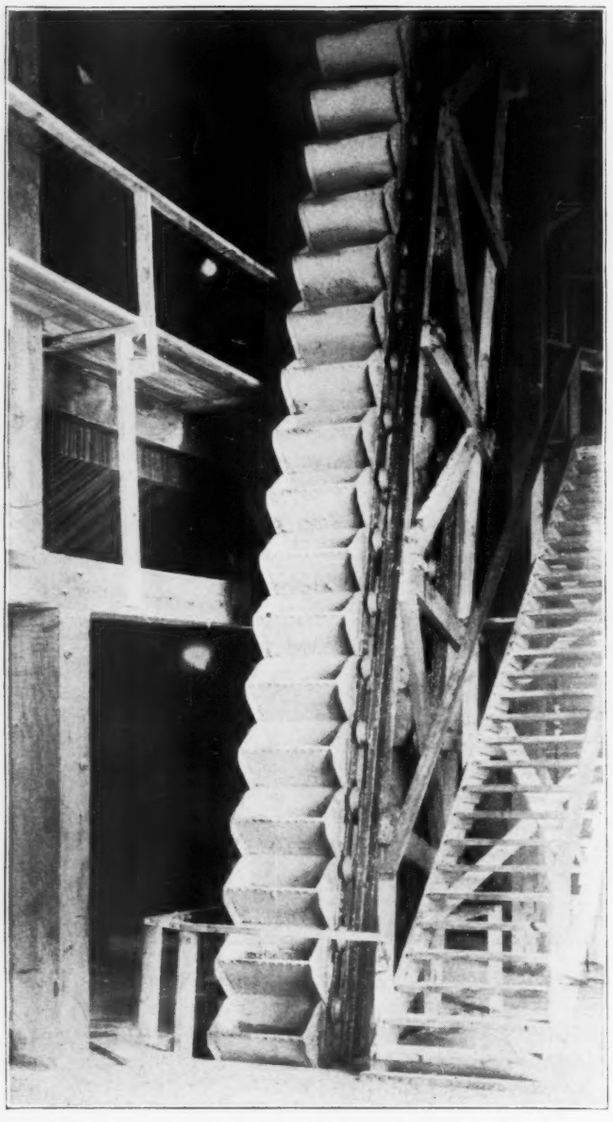
storage bin and from there it is fed to the washing plant. The oversize goes to a No. 6 Allis-Chalmers gyratory crusher, driven by a 100-hp. General Electric motor, which is used as a primary crushing unit. An Allis-Chalmers No. 5 gyratory crusher driven by a 100-hp. General Electric motor, and a Symons 4-ft. cone crusher, operated by a 75-hp. Allis-Chalmers motor, are used as secondary crushing units. All of these are equipped with slip rings.



Conical screens in washing and sizing department, plant A



Tipple at plant A, showing (left) elevator from field hopper, and (right) one of the loading bins



Bucket conveyor from crusher to screen, plant B

From the crushers the stone is carried back to the screens by a bucket elevator driven by a 25-hp. General Electric motor. This elevator, which was built by the Greenville Manufacturing Works, is of all-steel construction and consists of 78 buckets, with 18-in. pits.

The washing and sizing plant is equipped with 14 Gilbert conical screens, 3 ft. by 4 ft. by 6 ft. Six of these screens have a 5/16-in. mesh, four have a 9/16-in. mesh and four have a 1¼-in. mesh. The other screens consist of three Hum-mers, 4 ft. by 5 ft., two of which have ½-in. by ⅝-in. perforations, and one ½-in. by ¼-in. perforations; one Niagara 3-ft. by 6-ft. vibrating screen, and one Simplicity 3-ft. by 6-ft. vibrating screen, both of which have ⅛-in. by ¼-in. perforations. The Gilbert screens are operated by 50-hp. General Electric motors. The Hum-mer screens are equipped with standard Hum-mer power set-up, consisting of two generator sets, driven by a 3-hp. General Electric motor. The Niagara and Simplicity vibrating screens are operated by a 5-hp. General Electric motor with belt drive.

Water for the washing operation is furnished by two 8-in. Allis-Chalmers pumps with 175-ft. head, each delivering 2,250 g.p.m. One of these pumps is located near by, the other by a water-hole at the old Detroit-Oxford plant. The two pumps connect with a 16-in. pipe-line the total length of which is 2,350 ft. One pump is driven by a 200-hp. Allis-Chalmers motor and the other by a 125-hp. Allis-Chalmers motor.

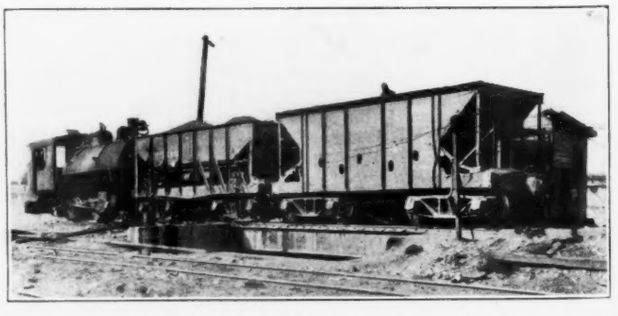
From the washing and sizing plant the material is carried to a storage pile by wooden chutes. Here it is picked up and carried through a tunnel by a 30-in. Goodrich rubber conveyor belt with 310-ft. centers and carried to a 4-ft. by 8-ft. double-deck Simplicity vibrating screen, where it is rewashed. Water for this operation is furnished by a small Allis-Chalmers pump. This pump, which draws water from an artificial lake near the plant, also supplies water for the locomotives and shovels. The top deck of this Simplicity screen has a ¾-in. mesh and the bottom deck, ¼-in. by 1/10-in. mesh. It is operated by a 10-hp. General Electric motor with belt drive. From here the material is carried on a 30-in. Manhattan rubber conveyor belt with 153-ft. centers to the loading hopper. The first conveyor is operated by a 50-hp. Allis-Chalmers motor with Texrope drive and the second by a 50-hp. Allis-Chalmers motor with belt drive.

Most of the motors here are equipped with Texrope drives which have given commendable service, according to Mr. Folkerth.

The Simplicity screens were installed in this plant in March, 1929. They are holding up in good shape and are doing effective work. What the company thinks of these screens is shown by the fact that in the last two years, 20 of them have been purchased and installed in the various plants.

The main loading bin, which has a capacity of 20 yd., is equipped with two chutes. It holds just enough to enable the loading crew to move a car that has been loaded and place another in position, without stopping the conveyor belt leading into the bin.

The arrangement of the belt conveyors and the loading layout of this plant is such that they can



Bottom-dump steel cars unloading into field hopper, plant A

load more than 1,000 tons an hour. There is also a tipple for loading trucks and another tipple built over the Eastern Michigan side track. These tipples consist of four wooden bins with capacity of 75 yd. each. The material is carried to the bins by a 30-in. Manhattan rubber conveyor belt with 160-ft. centers, erected over the Michigan Central right of way.

The regular production schedule of this plant calls for two shifts in the screening and grading plants and one-day shift on the loading operations. About 90 men are employed. The operating season extends to Thanksgiving, after which the plant is shut down during the winter. It is opened up again about the first of April. The maximum daily capacity is 163 carloads. Approximately 1,200,000 tons of gravel and sand were produced last year and, judging by the volume at the time this article is written, the production this year will run much larger.

This plant has a blacksmith shop which takes care of the ordinary run of repair work. All machine work, however, is done by another plant owned by this company, which is especially equipped for this class of work. This shop is housed in a 20-ft. by 30-ft. frame building. It is equipped with a drill press, two grinding wheels, a power hack-saw, an electric welding machine, a pipe-threading machine, bolts, and dies. A complete assortment of spare parts is carried in the store-room housed in an adjacent building.

In line with the merchandising policy of practically all large sand and gravel producers, this company does no delivering, all materials being sold f.o.b. the plant. Although the percentage varies greatly, according to local demand, present sales run about 20 per cent by truck and the rest is shipped by railroad. The territory served by this plant extends north to Bay City and south to Ann Arbor, Mich. The Flint and Saginaw territories furnish many good customers, but most of the output is sold in Detroit and vicinity.

With its system of putting washed material in storage, then drawing from a large storage pile

Shovel in pit at plant B

One of the double-deck vibrating screens, plant B

and mixing, this plant is well equipped to furnish any combination that the trade might require. The layout and arrangement of the storage piles in relation to the belt conveyors and loading bins, make it possible to change from one combination to another, or even to supply a combination that is not standard, with no loss of time.

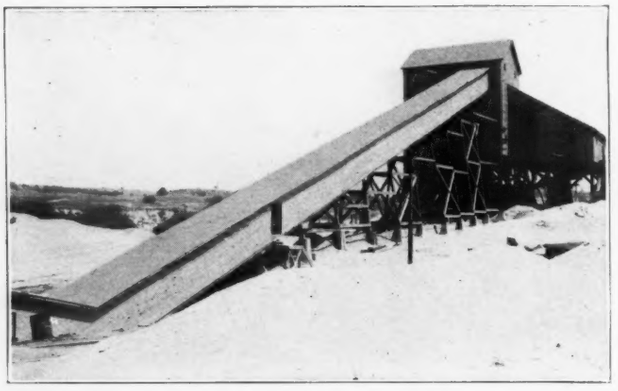
Sales are made to city, state highway and street officials, building and road contractors, and building-supply dealers. The official name of the plant is 13-A of the American Aggregates Corporation. It is known locally as the Ray plant, or Plant A..

## Plant 13-B

The Fuller plant, or Plant B, is located a half mile west of Oxford. It is under the direction of G. W. Tryon, plant superintendent. Its official name is Plant 13-B of the American Aggregates Corporation.

This plant has direct railroad connections with the Michigan Central and Grand Trunk railroads. It is operating in a tract of 120 acres, including the acreage formerly owned by the old Detroit-Oxford plant, into which this plant is gradually extending operations. About 80 acres have been excavated, including about 20 acres worked by the old Detroit-Oxford plant.

The deposit of sand and gravel runs about 20 to 25 ft. above the water line. Dry excavations only are being carried on and no equipment has been in-



**Conveyor from field hopper to scalping screen, plant B**

stalled for picking up the material below the water-line. The deposit is uniform in size and quality, except that, occasionally, there is a small pocket of pure sand and, in rare instances, clay pockets are encountered. The percentage of stone is heavier in some spots than others and the top of the deposit contains more clay and surface dirt. The ratio of sand and gravel varies greatly, with an average of 40 to 60 per cent of each.

The overburden here is about 4 to 10 ft. deep. It is removed by steam shovel and dump trucks. An Erie steam shovel with 1-cu. yd. dipper and ⅝-in. plow-steel cable, and six trucks—three Standards and three Macks—are used for this purpose. The waste material is dumped into old pits from which the sand and gravel have been removed.

In the pit the material is picked up by a steam shovel and conveyed by dump cars and steam locomotive to a field hopper. The equipment consists of a Bucyrus 50-B steam shovel with 1-cu. yd. dipper and ⅝-in cable, and 12 Western side-dump cars, holding 7 cu. yd. each. For hauling the cars, two steam locomotives are used, one 20-ton Vulcan and one No. 18 Montreal.

The dump cars are unloaded into a concrete field hopper holding about 50 tons. The material is carried thence to the scalping screen by a 30-in. rubber conveyor belt, about 400 ft. long. Grizzly bars over the mouth of the field hopper sort out the stones that are 8-in. and larger, and these are picked out by hand and dumped into an Allis-Chalmers jaw crusher which reduces them to 4-in. and smaller. From the crusher the reduced stone is conveyed on a short rubber belt to the main conveyor belt which carries it to the scalping screen.

The main conveyor belt discharges into two 60-in. single-jacketed revolving screens, 12 ft. long between trunnions, with 7-ft. overhang, built by the Greenville Manufacturing Works. They are operated by a 50-h.p. General Electric motor. These screens grade the material to 2-in. and smaller, and the oversize goes by chute to two crushers, a No. 5 and a No. 6 Allis-Chalmers Gates crusher, for further reduction. From these crushers it is returned to the screens by an 18-in. supercapacity bucket conveyor, built by the Greenville Manufacturing Company and operated by a 25-h.p. General Electric motor. The crushers are operated by direct-connected 100-h.p. General Electric motors, equipped with slip rings. The conveyor belts in this plant were made by the Goodyear Rubber Company.

The sand and gravel passing through the scalping screen are carried by chute to four Niagara double-deck 4-ft. by 5-ft. vibrating screens. These screens, which are operated by a 5-h.p. General Electric motor, grade and size the product, ready for the storage or loading bins.

Five concrete bins are used for storage, these holding a total of about 45 carloads. The usual production schedule calls for grading the material in these bins in five sizes: 1-in. to 2-in. pebbles; 1-in., ½-in. to ¼-in., ¼-in. to 1/10-in., and sand. From the storage bins it is carried by a 30-in. rubber conveyor belt, about 600 ft. long, to the loading tipple, where it passes over a stationary screen and is rewashed.

This plant, like Plant A, does no delivering and all shipments are made by railroad. There are no facilities for loading trucks, this branch of the business being taken care of at Plant A, which is only about 1½ miles away. The chief market for this plant is Detroit. Shipments are also made to Bay City, Flint and Saginaw, Mich.

In addition to the plant superintendents of the two plants, E. E. Mills, manager of operations, has charge of both plants, as well as the plants of the American Aggregate Corporation at Birmingham, Brighton, and New Hudson, Mich.

## Observations on Soundness Tests

(*Continued from page* 54)

severe form. It, therefore, accomplishes the desired results in a direct way rather than in the indirect and apparently uncertain manner of the sodium sulphate test.

7. In the present tests the Portland cement mortars were quite rapidly attacked through the action of freezing and thawing and possibly they are the cause of certain forms of distintegration of concrete. Some of the mortars disintegrated to an even greater extent than the worst of the coarse aggregates. This line of investigations should be pursued further to determine the effects of excess water and impurities in the sand, such as clay, excess silt, etc.
8. It is indicated that the amount of disintegration due to freezing and thawing of Portland cement mortars is dependent not on the richness of the mortar but rather on the amount of free water present or on pore space which exists after evaporation of the free water.

As before stated the above indications are not to be considered as final and an extended investigation may lead to a reversal in some instances or at least a modification of the above statements.

# Concrete Materials Corporation Produces Washed Sand and Gravel at Clarksville, Iowa

## Unusual Amount of the Gravel Requires Crushing

THE Concrete Materials Corporation of Waterloo, Iowa, operates three sand and gravel plants in a state in which good sand and gravel deposits are notoriously scarce. One of these, a dredging operation, is located at Gilbertville, about 9 miles southeast of Waterloo. Another, also a dredging operation, is located near Eddyville, in the southeastern part of the state. The third, described in this article, is located about 2 miles north of Clarksville which is 38 miles northwest of Waterloo. The company also operates a crushed-stone plant at Bethany, Mo.

The property at Clarksville consists of about 100 acres, 40 of which contain gravel. It is located on the bank of the Shell Rock river, a tributary of Cedar river. The deposit is about 60 per cent sand and 40 per cent gravel of which about 20 per cent is large enough to require crushing. The overburden averages 4 ft. in depth and the gravel deposit about 14 ft. Shipments are made over the Chicago, Rock Island & Pacific Railroad which runs by the plant. Most of the product is used for highway work, bridge work, and ballast although some goes to Waterloo for building work.

Gravel is at present being excavated in two different sections of the deposit. In the north pit a Monighan 72-ton electric walking dragline handling a 2¼-cu. yd. dragline bucket loads the gravel into a 50-ton-capacity steel railroad bottom-dump car. This is hauled a distance of about 600 ft. to the plant by a 12-ton Plymouth gasoline locomotive. While waiting for the car to return from the plant, the dragline removes overburden and dumps it back into the pit where all of the gravel has been removed.

Gasoline dragline loading car at the south pit

In the south pit a P & H Model 600, gasoline crawler dragline with a 45-ft. boom equipped with a 1¼-cu. yd. Omaha bucket loads into another 40-ton car of the same type described above. This is hauled a distance of about 800 ft. to the plant by an old Diamond T truck fitted with flanges on the

General view of plant from southwest. Gasoline locomotive at right hauling loaded car to plant hopper

The two gyratory crushers under the scalping screen

Walking dragline loading car drawn by gasoline locomotive

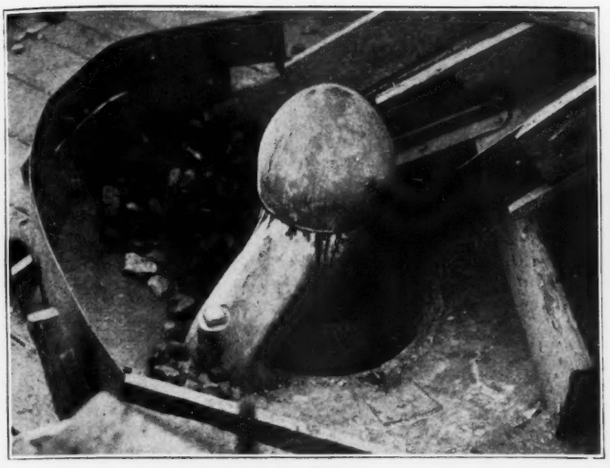
wheels and loaded down with sand bags to give sufficient traction. The overburden is disposed of in the same manner as at the north pit. Another 12-ton Plymouth and two more 50-ton cars have been added recently to the transportation at the pit, the extra engine and the cars going to the dragline which first completes loading a car.

## Plant Operations

The cars are dumped at the plant into a circular concrete track-hopper 16 ft. in diameter, which discharges through a Link-Belt pan feeder onto the inclined conveyor to the scalping screen. This hopper is part of the new section of the plant which went into operation in April, 1928, most of the concrete being poured during zero weather. This, the scalping screen and crushing building, and the conveyors between them were built at the same time and were designed by the company. The hopper is so designed that the tracks can be rotated on a turntable allowing the gravel to be brought in from any direction. The bearing of the turntable is on rails embedded in the concrete walls of the hopper so that two men with crowbars can easily rotate it. The feeder is chain-driven from the belt conveyor tail pulley.

The conveyor from the hopper is 24 in. wide and on 119-ft. 10-in. centers. It has a slope of 18 deg. and is driven at the rate of 350 ft. per min. to prevent slippage during wet weather. It discharges into a Toepfer 48-in. by 12-ft. revolving scalping screen with 2¼-in. perforations. This is chain-and-gear driven from the same motor which drives the belt conveyor. The oversize goes through a split chute to two gyratory crushers on concrete

Crushing plant from northwest



Looking down into large crusher

One of the two sand cones

foundations under the screen. One of these is an 8-in. Superior McCully and the other an Allis-Chalmers Gates No. 4 K. These are belt-driven by General Electric and Allis-Chalmers 25-hp. electric motors respectively.

Both crushers discharge onto an inclined return belt conveyor which discharges through a chute onto the first conveyor to the scalping screen. This conveyor is 18 in. wide, on 72-ft. centers, and is driven by a 5-hp. General Electric motor. The material passing through the scalping screen discharges onto the main inclined conveyor to the screening plant. This is 24 in. wide and on 306-ft. centers and passes over a highway and over the main track and a siding of the Rock Island railroad. It and the screening plant and bins are part of the original plant of Link-Belt design which was purchased by the company in November, 1927. The entire plant is of wood-frame construction with concrete foundations.

The main conveyor discharges into a steel divided chute feeding two sets of three Link-Belt Dull conical screens. These screens have, respectively, ¾-in., 9/32-in., and 3/16-in. perforations. They produce ¼-in. to 2¼-in. concrete road gravel, ¼-in. to 1½-in. bridge gravel and 3/16-in. to 9/32-in. pea gravel. All of these sizes go directly to bins. The pea gravel can be diverted to an Eagle Iron Works shaker screen when it is desired to put the ¼-in. to 9/32-in. pea gravel into the coarser gravel.

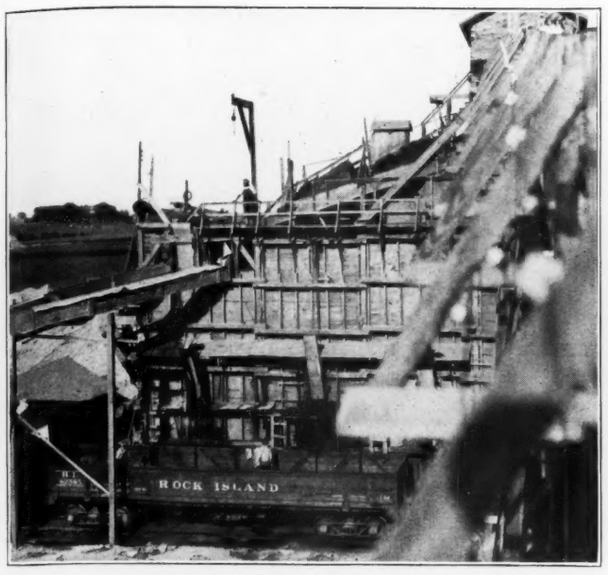
Plant viewed from northwest. Office and inspector's house in foreground

**Close-up of crushing plant. Upper conveyor carries material from hopper to crusher; below is return conveyor**

The coarse gravel can be run over a stationary screen for the production of special sizes. The material is washed by a jet of water in the chute feeding the conical screens and other jets in the screens.

The material passing through the 3/16-in. screen goes to two Link-Belt Dull sand cones which separate out the extremely fine sand and dirt. The wash water is flumed to an abandoned pit near the plant. The main conveyor is driven by a 40-hp. Allis-Chalmers motor through double reduction gears and the screens by a 20-hp. General Electric motor through gear and chain. The four wooden bins have a total capacity of about 10 carloads and discharge into cars on a siding through Link-Belt gates. The gravel is rewashed by jets of water over the perforated chutes from the gates to the cars. The plant has a capacity of 50 cars in 10

**Close-up of screens. Note rollers for keeping perforations clear**

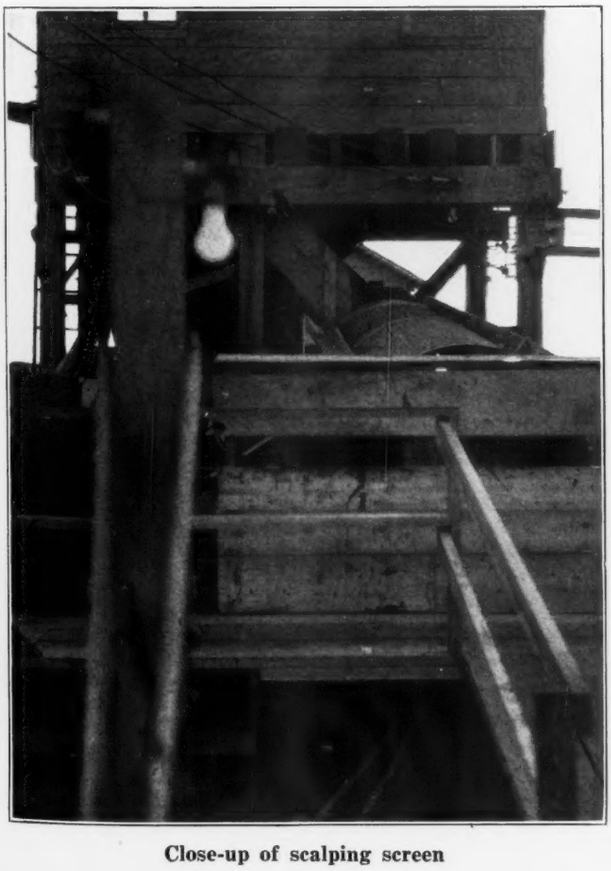



Screening building from south

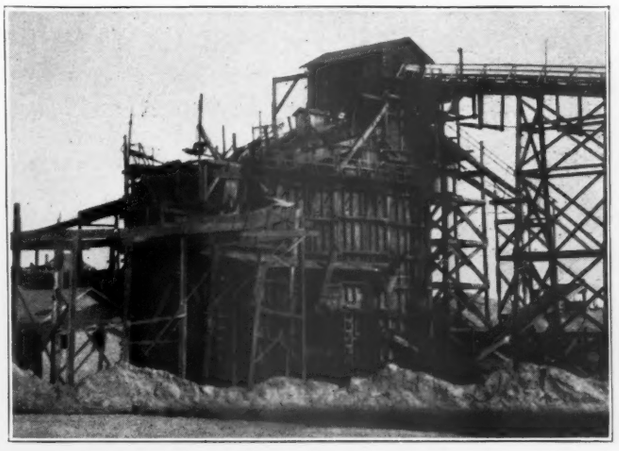
hours but, due largely to the state road-building program now under way, has been operating 20 hours per day all summer to supply the demand. Cars are spotted under the chutes and switched by a third Plymouth 12-ton gasoline locomotive.

## Miscellaneous

Washing water for the plant is furnished by a pump-house on the bank of the river about 1,000 ft. from the plant. Two Allis-Chalmers size 5 centrifugal pumps with a capacity of 1,000 g.p.m.



Close-up of scalping screen



Screening plant from west

at 180-ft. head, each driven by a 75-hp. motor of the same make and with individual intakes, pump through the same pipe-line to the plant. Crane valves and fittings are used.

An American Locomotive Crane Company steam flat-wheel type crane, handling a ½-cu. yd. Lakewood clamshell bucket is used for stockpiling material at the plant. A Byers Bearcat crane with a ¾-cu. yd. bucket is also used for this purpose. All conveyor belting was furnished by the Cincinnati Rubber Company. Drive chains and belt conveyor idlers were furnished by the Link-Belt Company.

A small but well-equipped machine and blacksmith shop contains all necessary machinery for making minor repairs as well as racks for bolts and small parts. There is also a plant office and a testing laboratory for visiting inspectors.

J. M. Galyean is superintendent of the plant. Officers of the company who maintain their headquarters in Waterloo are: H. D. Bellamy, president; T. E. Rust, vice-president; and C. E. Oldham, secretary and treasurer.

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The potential power of the South Fork of the Stilaguamish River between Blackjack Creek and Granite Falls, Washington, amounts to 64,500 horsepower for 50 per cent of the time or 58,100 horsepower for 90 per cent of the time, according to a short report prepared by D. J. F. Calkins, a hydraulic engineer of the Geological Survey, Department of the Interior. This report may be consulted at the office of the Geological Survey in Washington, D. C., or 404 Federal Building, Tacoma, Washington.

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Five dam sites on Clark Fork, Montana, are described in a brief report prepared by W. A. Lamb, a hydraulic engineer of the Geological Survey, Department of the Interior. This report may be consulted at the office of the Geological Survey at Washington, D. C., or 45 Federal Building, Helena, Montana.

# Small Plant in Missouri Ozarks Produces High-Grade Sand and Gravel

By CARL W. LIBERG

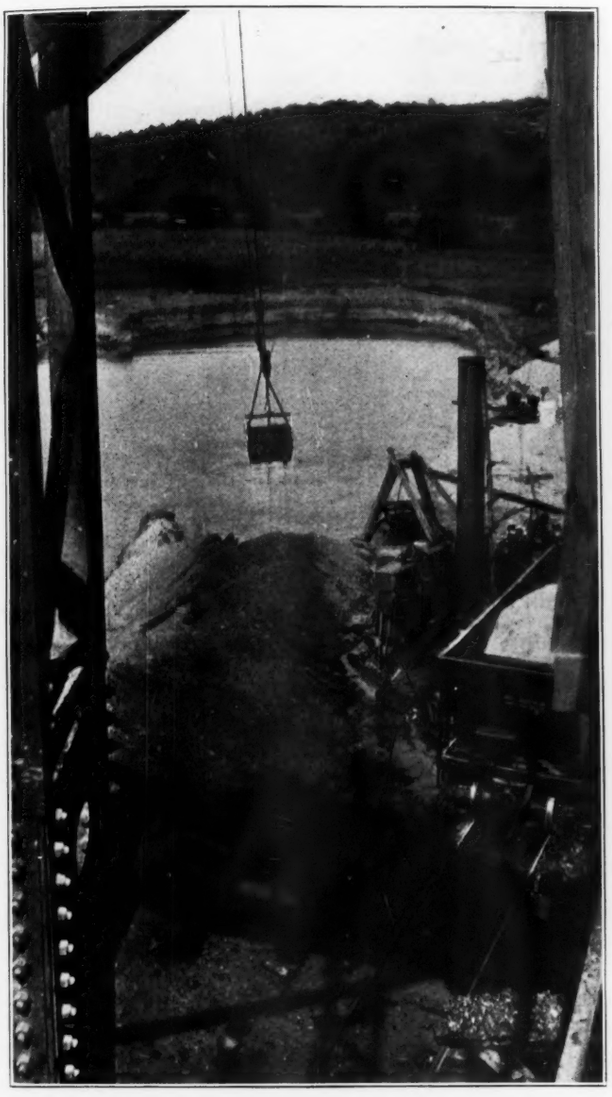
NESTLED in a scenic valley at the very gateway to the Ozark Mountains, seven miles south of Festus, Mo., is located an active and thriving sand and gravel property which excavates, screens and ships approximately 700 tons of sized material a day. This property, attractively named the Arrow-head Sand and Gravel Company, is owned and operated by the Carmichael-Cryder Construction Co. of the Rialto Building, St. Louis, Mo.

As an observer enters the small railroad station of Plattin, Mo., on the Mississippi River and Bonne Terre Railroad and looks down upon Plattin Valley, his attention is drawn to the large steel mast and dragline equipment around which the Arrow-head activities center. The Sauerman dragline with its 1½-yd. bucket and the auxiliary Sauerman 1½-yd. Crescent scraper used as a feeder for the main dragline, work in a 27-ft. field deposit of uniformly good gravel, no lot of which has ever failed to pass the Missouri State Highway or City of St. Louis bridge and paving specifications. The deposit covers an area of 45 acres and is unusual in that it lies on a bed of solid rock. Thus the difficulties arising from clay bottoms which are encountered by many gravel pit operators will never worry those in charge at the Arrow-head property. An overburden of two to three feet of loamy soil is no drawback to operations and requires no special attention because of the ease with which it washes out during the subsequent screening and washing operations.

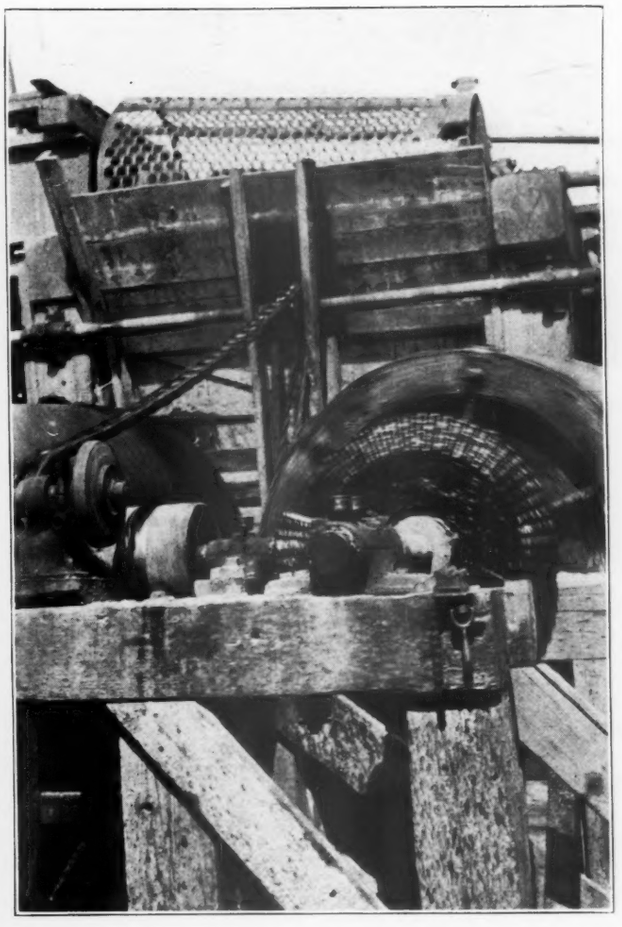
The material is discharged by the dragline bucket into a receiving hopper at the top of the screening plant, where gravity and a stream of water from a Gardner-Denver 6-in. by 4-in. by 6-in. auxiliary hopper supply-pump direct it through chutes into a battery of two Gilbert type Stephens-Adamson 3-ft. by 7-ft. scalping screens having screen openings of 2 inches. Oversize passes through an 8-in. by 24-in. New Type Universal jaw crusher and is returned to the scalping screens by a home-made bucket elevator.

From the scalping screens the material is chuted into a battery of two 3-ft. by 7-ft. roller-driven Stephens-Adamson double screens of the Gilbert type, where it is washed and separated into three sizes, 2-in. to ⅝-in., ⅝-in. to ⅜-in., and sand.

General view of screening plant, dragline mast, and hoist-shed



Dragline operating in pit



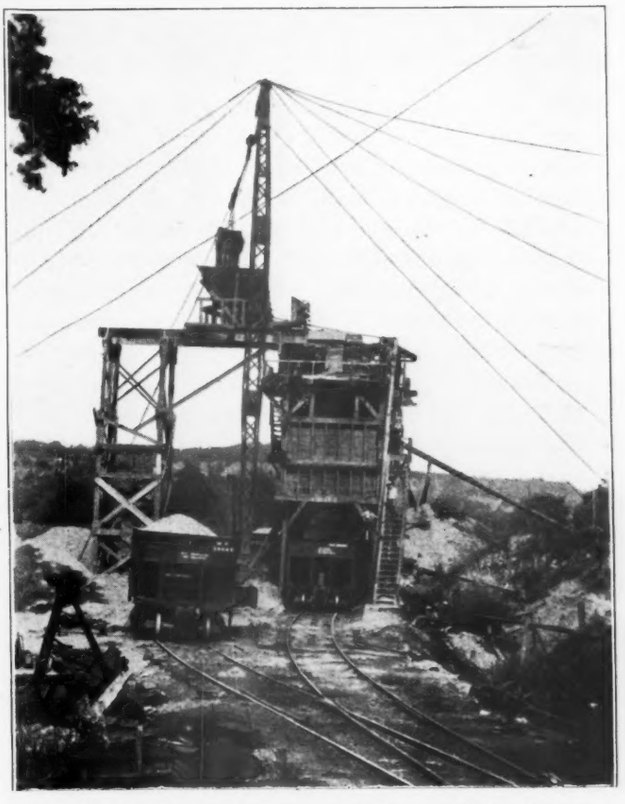
Screening and washing equipment

Water is pumped to the screening floor by a Worthington 14-in. by 8½-in. by 10-in. steam-driven force pump. Two 15-h.p. John Ramming vertical steam engines furnish motive power for the screening and crushing equipment.

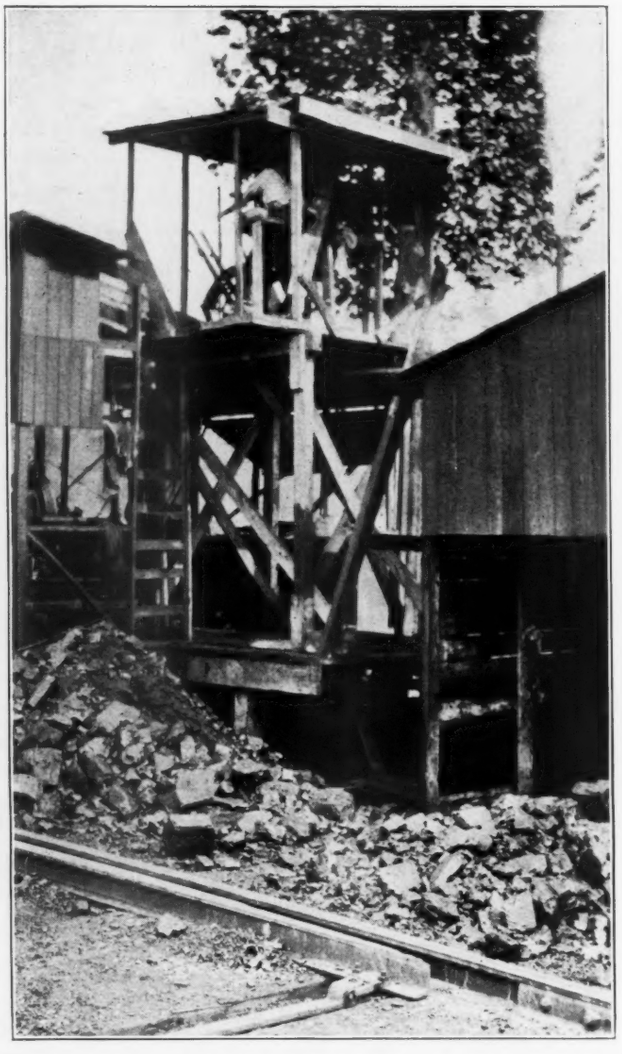
From the double screens the sized products are chuted directly into separate bins each having a capacity of 35 cu. yd., and loaded into cars through openings at the bottom of the bins.

Steam for all pit and plant operations with the exception of the Crescent auxiliary dragline, is generated in an Erie Economic boiler by 100-h.p. capacity. A 10-in. by 12-in. Lidgerwood hoist is used for the main dragline operation, while an 8¼-in. by 10-in. Reliance hoist, powered by steam generated in a 60-h.p. Scotch marine-type Huber boiler, operates the auxiliary scraper.

A Browning standard 20-ton crane unloads surplus gravel from the loaded cars whenever production exceeds demand. Ample storage facilities makes continuous operation possible and, except for a short shut-down during the most severe



Dragline bucket emptying gravel into receiving hopper



**The hoistman has unobstructed view of bucket at all times**

winter weather, the plant is active throughout the year.

Seventeen men make up the operating force. Under the supervision of A. J. Cryder, plant superintendent, these men have succeeded in following the safety policies outlined by the president, H. M. Cryder, and have made a commendable safety record. Since the opening of the pit four years ago, not a single day has been lost by any of the men because of an accident. Evidence of the same spirit which has made possible this fine safety record can be seen also in the efficiency of Arrow-head operations and in the general feeling of good-will which prevails throughout the organization.

## Compilation of Information on Nonmetallic Minerals

The building up of a file of technical information on nonmetallic minerals has been an important activity of the Building Materials Section of the United States Bureau of Mines, Department of Commerce, since the organization of that section in May, 1928. The files cover about 40 minerals, the more important of which are: stone in all its branches, sand and gravel, cement, lime, slate, clay, asbestos, feldspar, fluorspar, talc and soapstone, abrasives, and silica. Under each commodity there are sub-classifications such as analyses, costs, lists of producers, milling, mining, occurrence, preparation, prices, production, specifications, substitutes, tariffs, transportation, uses, and many others. Thereafter a series of geographical folders are alphabetically arranged covering each State or country on which information concerning this particular commodity is available.

The purpose of this file is not only to provide a ready source of information for answering the numerous inquiries, but the data thus compiled serve to supply the groundwork for the special economic studies that are undertaken.

## Cement Mills Struggle Against Huge Over-Capacity

American portland cement mills are still operating at only about two-thirds capacity, according to Wm. M. Kinney, general manager of the Portland Cement Association, Chicago. Taking into consideration the production for the past year, based on statistics recently released by the Bureau of Mines and the Department of Commerce, the ratio of operations to capacity of the cement mills for the last twelve months was 68.2 per cent. The highest ratio for 1929 was 71 per cent which was registered during January. The ratio percentage since May has been under 70 per cent, according to the monthly Bureau of Mines survey falling to 68.2 per cent in August.

An interesting example of a small crushed stone plant which is entirely driven by a semi-diesel engine is the Rockport Stone Company at Columbus Grove, Ohio. This plant has been in operation about 6 years and has a capacity of 160 tons per day.

The machinery consists of an Austin hoist which hauls a 1¼ yd. steel car up the incline from the quarry to the plant, the Allis-Chalmers Gates No. 3 primary crusher, the Austin 3 ft. by 8 ft. revolving screen, the Gates No. 2 recrusher and a bucket elevator. These are all belt or chain driven from a line shaft which is belt driven by a "Primm" 75-hp. low compression, horizontal semi-diesel engine. A small air compressor and pump are also driven direct from the engine.

This engine has been in operation since the plant was built, during which time 160,000 tons of crushed stone have been produced. Practically no repairs have been necessary in that time, the owners estimating the total maintenance expense at less than ten dollars.

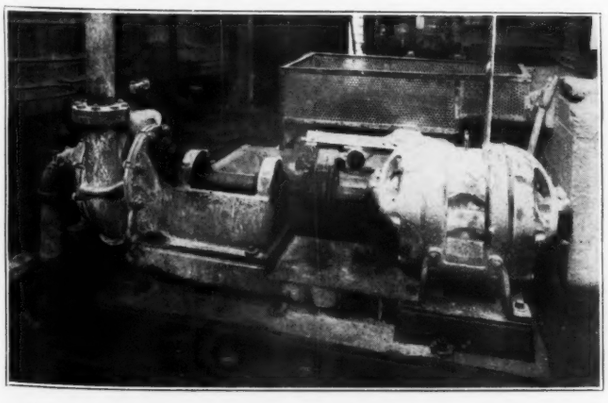
Operating at full load all day the engine operates with a fuel and oil cost of about $2.00 per day, using 3½ gallons of fuel oil per hour.

# Slurry Having Both Abrasive and Corrosive Properties Can Be Pumped Efficiently

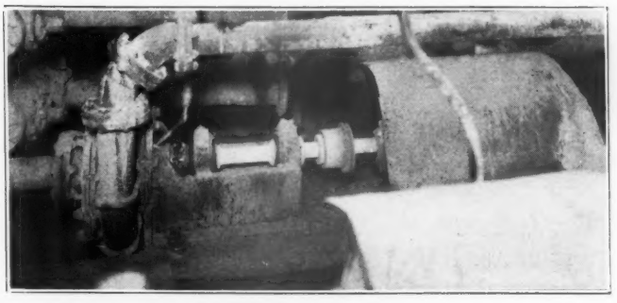
THE Structural Gypsum Corporation, Linden, N. J., maintains two operating divisions, a neutralizing department and a gypsum-products department. In the neutralizing department a by-product slurry is received from another plant located 2½ miles distant. This slurry's physical and chemical characteristics vary considerably throughout the series of pumping processes, but initially it is very abrasive and corrosive. The acid contained in the slurry would cause considerable trouble in an iron-fitted pump. Because of these severe conditions, the pumping installations of this company prove unusually interesting.

The neutralizing department contains eight Morris motor-driven slurry pumps, both horizontal and vertical, and these have performed to the entire satisfaction of the company's engineers. Because of the corrosive effect of this mixture, the pumps handling it are built of an acid-resisting composition, tested and approved by Morris Machine Works' engineers to withstand corrosion effectively. The alloy used in the pumps, furthermore, has the property of hardness without brittleness, is uniform in structure and resistant to abrasion. As the slurry passes through the various processes, the acid condition is gradually eliminated until finally, when it is delivered to the gypsum department, it is entirely neutralized and can be handled economically by standard slurry pump units.

The raw acid slurry as received by the neutralizing department is a by-product of another plant located 2½ miles away. This plant manufactures acids and phosphates, the by-product containing gypsum or calcium sulphate, which is pumped the entire distance to the gypsum plant. Four Morris 5-in. type S pumps are used for this purpose, arranged in duplicate series of two, one series unit always being available for stand-by service. These



**4-in. slurry pump in gypsum department. Temperature of slurry is 150 deg. to 180 deg. F.**



**4-in. acid-slurry pump in neutralizing department delivering maximum capacity of 600 gal. per min. against total head of 56 ft.**

pumps are inter-connected so that one pump is used independently under normal conditions. For peak service, however, two units are operated in series; the entire installation being contained in one pump house near the source of supply. This arrangement is a decided improvement over the previous layout of competitive pumps, one of which, acting as a booster, had to be located midway in the line. The Morris installation, therefore, has eliminated this isolated booster plant, centralizing the operations in one point, thus decreasing the labor cost. Variable-speed driving motors provide the flexibility required both as to capacity and consistency.

Returning to the actual conditions in the Structural Gypsum Corporation's plant, the majority of the pumps are 4-in. size, type S, each capable of delivering a variable capacity of 200 to 650 gallons per minute of slurry containing respectively 60 per cent to 20 per cent solids by weight. Variable-speed slip-ring motors are used in this instance, also, to obtain constant output of solids regardless of the percentage of moisture in the mixture. Increased production resulting from this uniformity of operation many times offsets the small additional power cost of variable-speed motors over the constant-speed induction type.

These units are designed for exceptionally high efficiency. In fact, the efficiencies under water test come well within the range of average water-pump efficiencies.

To further minimize power cost, Morris engineers have designed these units so that their high efficiencies may be maintained during the life of the wearing parts. This is accomplished by a suction sealing ring, easily adjustable from the outside, reducing internal leakage. To reduce repair costs, comparatively inexpensive liners are fitted as protection for the parts of the pump proper. The shell and impellor are extra heavy and of

maximum thickness to insure longest life. The shaft is protected through the stuffing box by a sleeve easily removed or installed, as it is not a pressed fit. Ball bearings designed to handle both radial and thrust load are fitted throughout. They are dust and dirt proof, insuring satisfactory operations under all plant conditions. The stuffing-box is extra long and is provided with a special seal.

Morris slurry and dredging pumps have a long established reputation, and the type S pump, which is the company's latest effort, bids fair to fix this reputation still more firmly in the minds of slurry-pump users.

## Accident Prevention Discussed in Ogden

One of the regional safety meetings that are sponsored by the Portland Cement Association was held, September 27, 1929, at Hotel Bigelow, Ogden, Utah.

The first session started at 10 o'clock, with O. C. Hart, superintendent of the Utah-Idaho Cement Company, of Brigham City, as chairman. By way of opening the meeting he said:

"The conservation of human life and the prevention of accidents is one of paramount importance, and the Portland Cement Association, through their untiring efforts, have made the cement industries the outstanding industrial concerns in the promotion of safety work. It has made a number of trophy awards to mills which have operated for 12 months continuously without a lost time accident and in a number of cases several plants have gone as long as 36 months without a lost time accident. Such records are the results of unceasing work and effort and we hope to be able to bring our Utah plants into line so that we obtain a perfect 12 months' score at least."

The program of this morning's session was as follows:

A. J. R. Curtis, assistant to the general manager, Portland Cement Association, "Safety Progress in the Cement Industry."

L. E. Howard, chief clerk, Utah-Idaho Cement Company, "How to Attain an Improved Safety Record."

Dr. C. E. Dorland, physician for Union Portland Cement Company, Devil's Slide, Utah, "Avoiding Infection, Dematitis and Conjunctivitis."

O. F. McShane, Utah State Industrial Commission, Salt Lake City, address on the "Problems Confronting the Industrial Commission," published elsewhere in this issue.

H. C. Day presided at the noon luncheon. He is vice-president of the Utah-Idaho Cement Company, and introduced the following gentlemen each of whom gave brief, interesting talks on safety matters: O. B. Gilson, agent Union Portland Cement Company; Dr. L. D. Mahannah, physician, Utah-Idaho Cement Company; F. H. Richardson, district engineer, Portland Cement Association, Salt Lake City.

The afternoon session was called to order at 2 o'clock by Herbert A. Snow, secretary, Portland Cement Company of Utah. The program was a round-table discussion of mill safety problems, led by R. R. Dorland, superintendent, Union Portland Cement Company.

For the quarrying and crushing departments, addresses were made by J. H. Hopkins, quarry foreman, Union Portland Cement Company, and E. J. Gallacher, superintendent, Portland Cement Company of Utah.

The mill department addresses were by J. H. Neill, vice-president Idaho Portland Cement Company, and E. D. Brimley, general foreman, Union Portland Cement Company.

The burning and coal-grinding departments were represented in the discussion by O. C. Hart, superintendent, Utah-Idaho Cement Company.

Shipping and cement storage were discussed by Francis Bray and Victor Williams of the Union Portland Cement Company.

Power, shops, and electrical departments were represented by Charles Weed, machinist, and W. S. Chrysler, electrician, of the Utah-Idaho Cement Company, and by R. G. Hansen, electrician, and W. F. Blackington, master mechanic, of the Union Portland Cement Company.

Safety in the yard and railroad departments was discussed by W. L. Hill, safety agent, Union Pacific system, and A. Peterson, foreman, Utah-Idaho Cement Company.

D. J. Parker, supervising engineer, U. S. Bureau of Mines, Salt Lake City, discussed and demonstrated first aid practices.

Ralph E. Bristol, secretary-treasurer, Utah-Idaho Cement Company, was toastmaster at the 6:30 dinner. The principal address was by Gerald Yearsley, safety inspector, Utah Industrial Commission, Salt Lake City.

## Indian Ceramic Society Publishes Journal

We are in receipt of several issues of the "Journal of The Indian Ceramic Society," published quarterly by its secretary, T. W. Talwalker in Poona, India. Mr. Talwalker secured the degree of master of science at the University of Illinois. The first number of the "Journal" was dated November, 1928. The Society was organized the preceding April with an initial active membership of 26, and by August of this year had 57 members who are distributed throughout the Indian provinces, engaged in ceramic industries or educational work. Its president is S. Deb, of Patna, and its vice-presidents are I. D. Varshnei, of Bahjoi, Thomas Steaphen of Quilon, and Sirdar Krishen Singh.

# Extensive Deposit in Adirondacks Is Commercialized By United States Feldspar Corporation

## Modern Aerial Tramway Connects Quarry and Plant

By F. A. WESTBROOK

THE quarry of the United States Feldspar Corporation is located more than two miles from the mill and at an elevation of about 640 feet above it. For the obvious reason of facility in loading freight cars, the mill is located near the railroad with its own siding instead of at the quarry.

In the quarry the rock is drilled with Ingersoll-Rand jackhamers and shot with 40 per cent DuPont and Atlas dynamite. The stone is loaded into aerial tramway buckets set on small flat cars for convenience in moving about the quarry. An Ingersoll-Rand electrically-driven compressor unit has been installed at the quarry for the operation of the drills.

A Bleichert system aerial tramway, manufactured by the American Steel and Wire Company and provided with steel towers, has been installed to transport the feldspar from the quarry to the mill. It is electrically driven and, due to the fact that the quarry is materially higher than the mill, the descent of the loaded buckets helps to haul up the empty buckets so that the power consumption is low. The present capacity of the tramway is 15 to 20 tons per hour, with a maximum capacity of 50 tons per hour, each bucket holding about 900 pounds.

West side of mill

Stock-pile near mill

Looking toward loading terminal of aerial tramway

At the mill end of the tramway the stone is dumped into a bin or onto an outdoor storage pile close to the bin. When stock is to be taken from the storage it is placed in the bin by means of a stiff-leg derrick and Hayward orange-peel bucket operated by an American Hoist and Derrick Company electrically-driven hoisting engine. This surplus storage, of course, insures a continuous supply for the mill in case the flow from the quarry should be temporarily held up by bad weather or repairs, or in case a sudden demand should for a short time increase the output of the mill beyond the capacity of either the quarry or the tramway. In other words, by the simple expedient of having a surplus storage pile, a considerable amount of flexibility is secured by means of which quarry expense and overhead can be kept at a minimum.

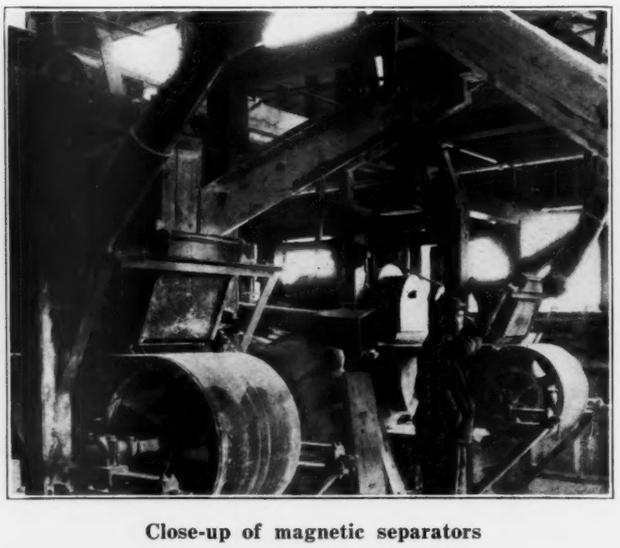
Quarry stone is fed from the bin by a Link-Belt steel apron feeder to a Traylor Bull Dog 18-in. by 30-in. jaw crusher which has a capacity of 60 tons per hour. The stone is broken down to about 2 inches in size.

It then passes by gravity through another apron feeder to a revolving washing screen of our own make and into a bin. An apron feeder discharges onto the picking belt which is a short Link-Belt belt conveyor where the unusable stone is removed. The picking belt discharges into a hopper which feeds, again through Link-Belt apron feeders, into two Blake crushers which crush the stone to ½-inch size.

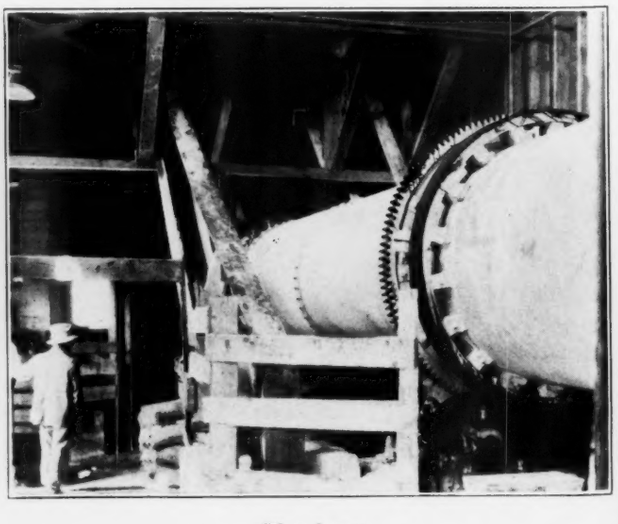
From this secondary crusher the stone is taken by a Link-Belt elevator to a bin from which it is fed by gravity into a Ruggles-Coles rotary dryer. After drying, the material is elevated into bins by a Sturtevant elevator. Stone from different parts of the quarry is placed in separate bins and samples are taken at frequent intervals for analysis, especially as to quartz content. The material is then weighed out of the bins in the correct proportions to make a feldspar mixture of known and controlled chemical constituents for the blending of a product suitable for the customers' needs or for the specialties made by the company itself.

The mixture is then taken by a Sturtevant elevator to a bin which feeds an 8-foot by 48-inch Hardinge conical mill. The mill discharges onto Hummer screens, out of which the material comes in the form of Bio-Spar crystals, already mentioned, for use in decorative work. These descend by gravity into bins, or are carried on to the pulverizing processes if destined for ceramic purposes.

The material for ceramic purposes is passed through two large magnetic separators of the Rowand-Witheral type for the extraction of iron and iron bearing materials, which is particularly necessary if the crystals are to be used in the man-



Close-up of magnetic separators



The dryer

Protective net over state highway

ufacture of electrical insulating products. From the two magnetic separators the material is carried by two Link-Belt belt conveyors to a Hardinge tube mill and from the latter to an Emerich air classifier made by Gayco.

The fines from the separators are deposited in bins from which they are loaded into freight cars in bulk by Link-Belt screw conveyors. The oversize from the air separator is returned to the tube mill by other Link-Belt screw conveyors. Very little material is shipped in bags.

This mill, which is new and is equipped with the best and most up-to-date machinery, has a capacity of 5 tons per hour and space has been provided for doubling this capacity. The wood framework of the building is covered with Robertson protected metal sheathing. All operations are electrified with General Electric equipment.

The United States Feldspar Corporation recently published an interesting booklet called "The Story of Feldspar" which gives in a brief and interesting way some of the salient facts about feldspar in general and this company's operations in particular. Because of the interesting historical and practical information contained in it, which almost anyone will be glad to know, it is a very effective bit of publicity. So the description of this company's operation at Cranberry Creek, Fulton Co., N. Y., cannot, perhaps, be concluded in any better way than by giving a few brief extracts from this booklet.

The first of these is a quotation from a U. S.

Installing jaw crusher

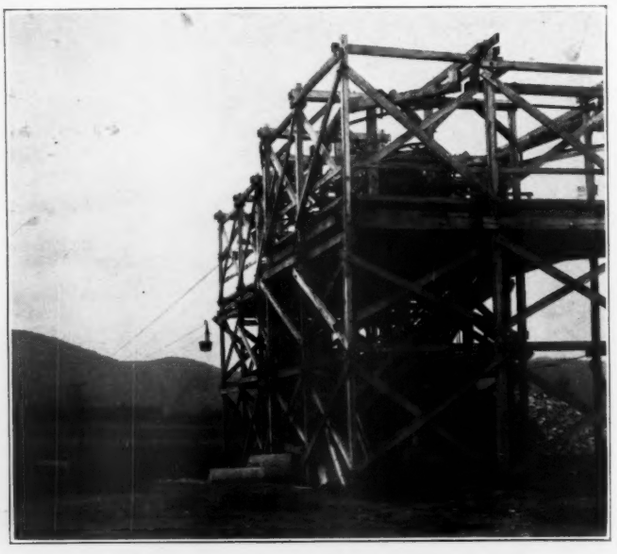
Government Report by A. S. Watts in which he says that "The feldspars of the Fulton County district, N. Y., are famous for their fine color, and have been drawn on exclusively for use in raising the quality of the output from semi-exhausted quarries in other districts.

The United States Feldspar Corporation's deposits cover about 3,500 acres, owned and leased for long terms, in the Mayfield Hills of Fulton County, which are foothills of the Adirondacks. In the booklet referred to there is a quotation regarding these deposits from Prof. J. B. Shaw, in which he says, "It is much better than a large percentage of the spar now on the market. Unless there are new deposits of spar as yet undiscovered, the price of feldspar must go up and you might find in a few years that you have the only feldspar available which is suitable for porcelain and white ware."

In another part of the booklet a summary is given of the manufactured products in which feldspar plays an important part and shows in a striking manner how essential this product is in our

Dumping gravel into mill bin from tramway bucket

West end of quarry



Discharge terminal of aerial tramway

everyday life. These products are: Pottery, porcelain, glass, porcelain enamel, stucco dash, chicken grit, concrete facing, electrical insulation, sand paper, emery wheels, paint, wood filler, terra cotta, abrasive soaps and powders, cements, polishes, sand blast material, scouring powder, tiling, sanitary ware, roofing grit, enameled brick, Faience work and so forth. Of course the fact that feldspar is the only known material which fuses, or melts, and acts as a cement, or binder, when mixed with clays and burned in a kiln, accounts for many of the above uses.

On the other hand, the company also turns out a product called "Fel-So," which is a scouring and cleansing powder for hard surfaces such as enamel, porcelain, glass, bath tubs, brass, nickel and so forth, where it is a question of making use of the abrasive qualities of feldspar rather than the cementing property under heat.

A third use for feldspar is illustrated in another product of the company called "Bio-Spar," which is pink feldspar associated with small quantities of quartz and mica. When crushed, this produces a very sharp granular material of a pleasing color which looks a good deal like granite and is used for non-skid floors, walks and facings for all sorts of brick, cement, stucco and similar kinds of poured, moulded or troweled structural work.

In closing, it should be stated that the United States Feldspar Corporation has lately consolidated with the Tennessee Mineral Products Corporation of Spruce Pine, N. C., and with the Oxford Mining & Milling Company of West Paris, Me. (see article in 1925 issue of Pit and Quarry for description of this plant) under the name of the United Feldspar Corporation, with offices at 10 East 40th St., New York City. The officers of this corporation are: President, Francis E. Haag; vice president and general manager, C. H. Peddrick, Jr.; secretary and treasurer, H. M. De Lanoie.

## American Road Builders' Association Chooses Official Nominees

The American Road Builders' Association Nominating Committee, which was elected by the Board of Directors at the meeting held at Cleveland, Ohio, January 18, 1929, has made public a list of official nominations for officers for the year 1930 to 1931 and directors for three years. Following are the nominees and the positions for which they are nominated:

For President

W. A. Van Duzer, Assistant Chief Engineer, Pennsylvania Department of Highways, Harrisburg, Pa.

For Vice-Presidents

J. R. Draney, Natural Rock Asphalt Corporation, Louisville, Ky.

Henry G. Shirley, State Highway Commissioner, Richmond, Va.

S. F. Beatty, President, The Austin-Western Road Machinery Co., Chicago, Ill.

Samuel Hill, Hon. Life President, Washington State Good Roads Association, Seattle, Wash.

For Treasurer

James H. MacDonald, Consulting Road and Paving Expert, New Haven, Conn.

For Directors Term Ending 1933

C. M. Babcock, State Commissioner of Highways of Minnesota, St. Paul, Minn.

T. H. Cutler, Chief Engineer, Missouri State Highway Commission, Jefferson City, Mo.

H. J. Kaiser, Kaiser Paving Company, Oakland, Calif.

W. M. Kinney, General Manager, Portland Cement Association, Chicago, Ill.

Wm. P. McDonald, Wm. P. McDonald Construction Co., Flushing, N. Y.

George F. Schlesinger, General Manager, National Paving Brick Manufacturers' Association, Washington, D. C.

John G. Townsend, Jr., United States Senator from Delaware, Washington, D. C.

## Paper Supplants Burlap in Feldspar Sacks

The Feldspar Grinders' Institute, Inc., announces that its members will adopt the use of the five-wall paper bag designed to hold 100 pounds of feldspar instead of burlap bags. This decision was made after a special committee and the Institute as a whole had considered the matter carefully.

At a recent meeting of the Institute held in Atlantic City, it was considered to be of mutual advantage for the manufacturer and the customer to change to these paper bags. This change will go into effect as of December 1st, 1929, the bags to be billed to the customer at cost and not to be returnable. Up to December 1st, 1929, the burlap bags will be handled in the same manner as before. The advantages and disadvantages of this change were considered by the members, and it was felt that the adoption of paper bags would mean less loss of spar, less contamination in transport, less breakage in packing and shipping, as well as the packages being waterproof and easier to handle in transport.

It is expected that this will be met with favor throughout the trade.

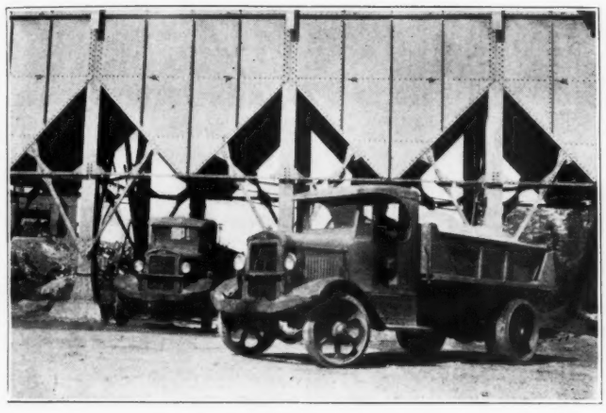
# Long Island Sand and Gravel Producer Puts New Unit into Operation

## Unusual Sideline Is Production of Humus Which Is Sold as Fertilizer

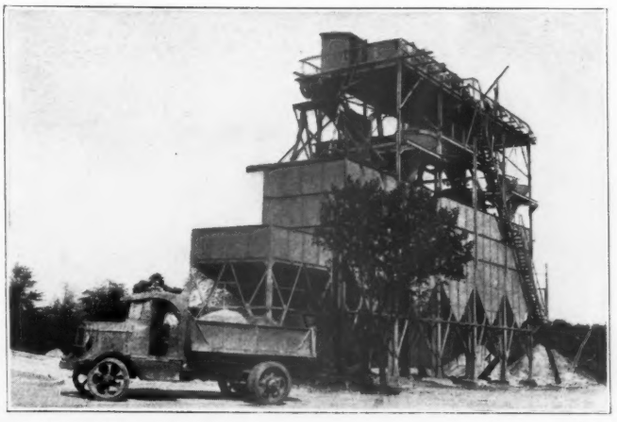
By W. E. TRAUFFER

THE firm of Dent and Kent, Inc., of Rockville Center, Long Island, although primarily sand and gravel producers, has several profitable sidelines, one of which is decidedly unusual. One of these is the manufacture of concrete blocks and the other the production of humus, which is sold for enriching soil in lawns and gardens in the vicinity.

The company was formed in 1914, and did a general contracting business until 1915, when all machinery was sold and the members of the firm engaged in war activities. In 1920 the firm again took up construction work until 1924, when the first of the two sand and gravel plants was built. The demand for sand and gravel, however, soon overtaxed the capacity of this plant and another was built, both being dredging operations. The new plant and dredge went into operation on August 1 of this year.



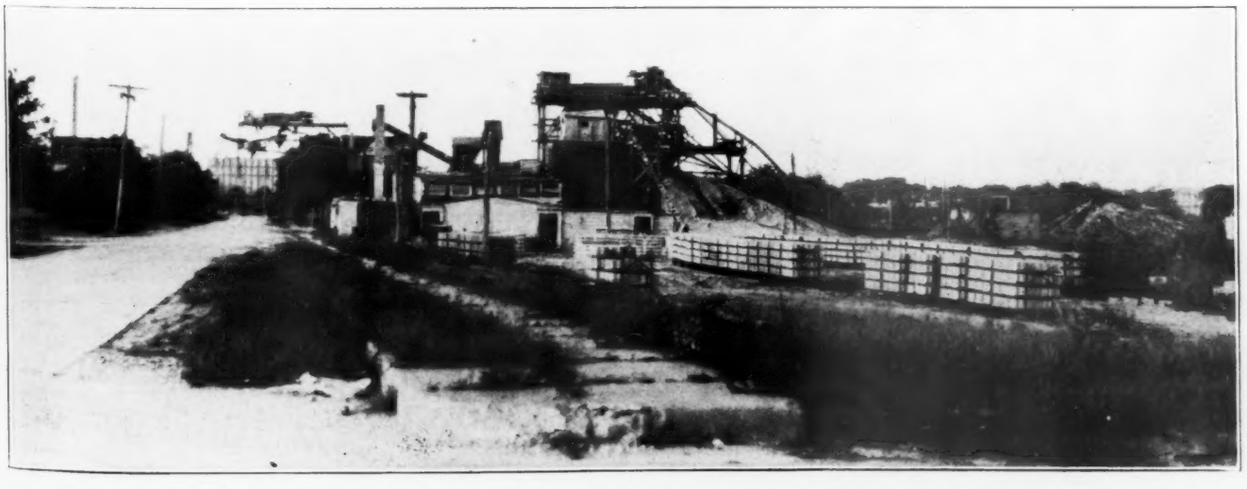
Trucks loading at new plant



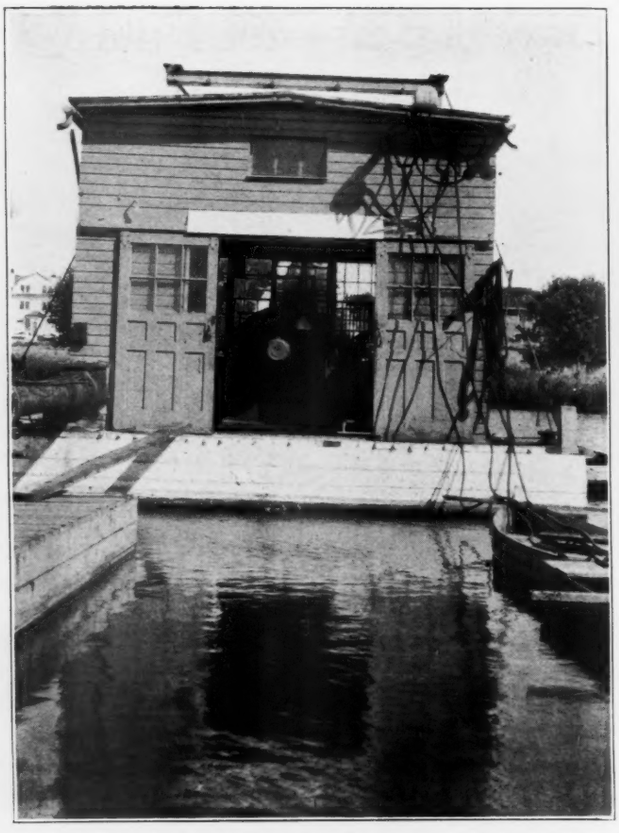
Loaded truck in front of new plant

### Description of the Deposit

The property of 20 acres is located on Mill river, ¾ mile west of Rockville Center, which is about 19 miles east of New York. The deposit is a quartz gravel containing about 80 per cent sand and practically no gravel over 6 in. in size. Test holes have shown the deposit to be 206 ft. deep and to contain remarkably few impurities. Some unusual things have been found in the deposit, however, among these being a mastodon's tooth, a meteorite, some white clay, leaf mold and pieces of conglomerate, petrified wood and copper ore. At a depth of 34 ft. there is an 8-ft. layer of fine pure quartz sand all of which will be retained on a 30 mesh screen. The overburden, from 3 to 8 ft. of humus, is removed by a Northwest 105 crawler crane with a 1-yd. Williams clamshell bucket and is piled aside for rehandling.



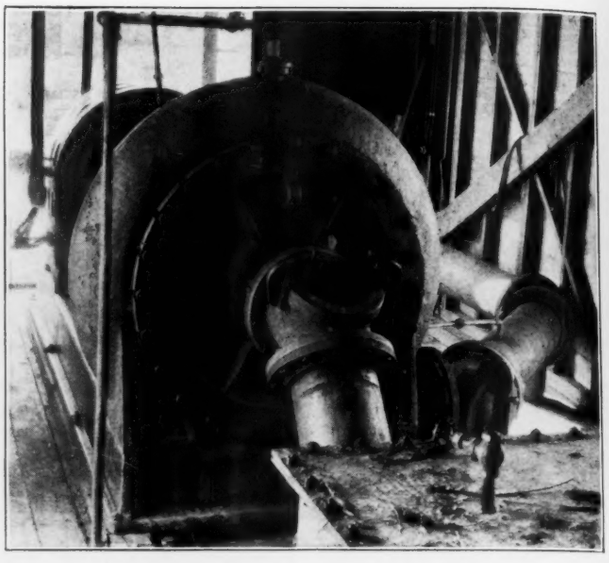
New plant in left background, old plant in center, and dredge at right. Concrete block storage in foreground



Rear of new dredge, showing motor and pump

## The New Dredge

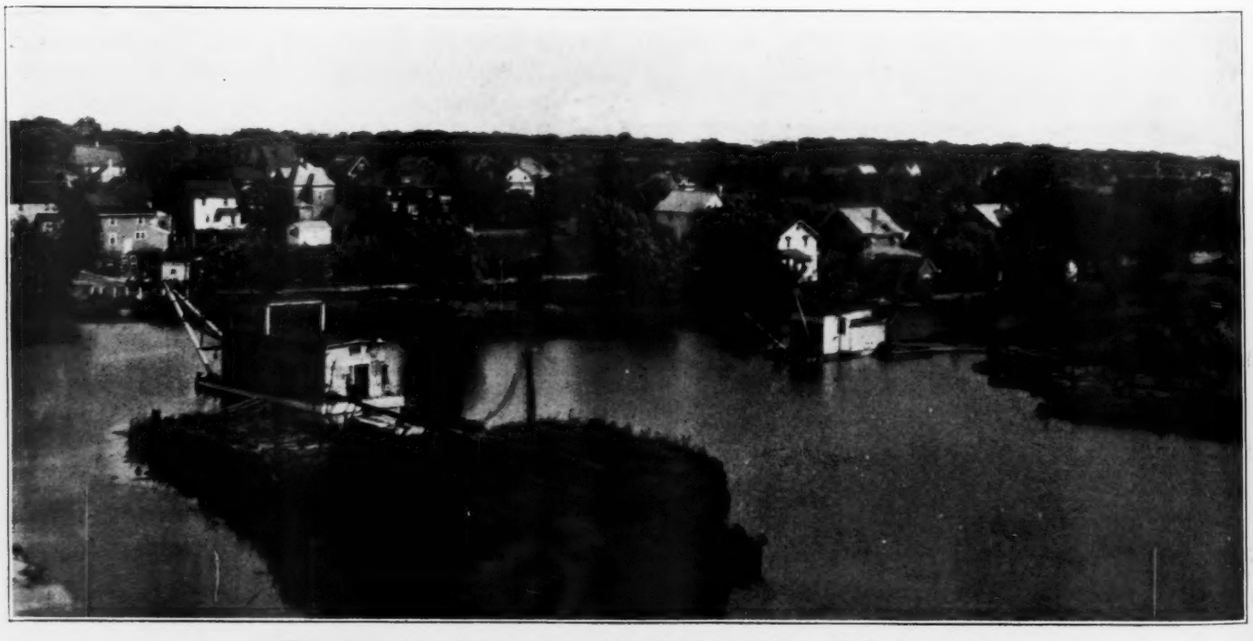
The new dredge is 70 ft. long and 34 ft. wide and is of wooden construction. A National Hoisting Engine Company 5 drum hoist driven by a 30-hp. electric motor raises and lowers the boom and operates the 4 front and rear swinging lines which hold the dredge in place. No agitator is used on the nozzle which will excavate to a depth of about 70 ft. The dredge pump is a Hetherington and



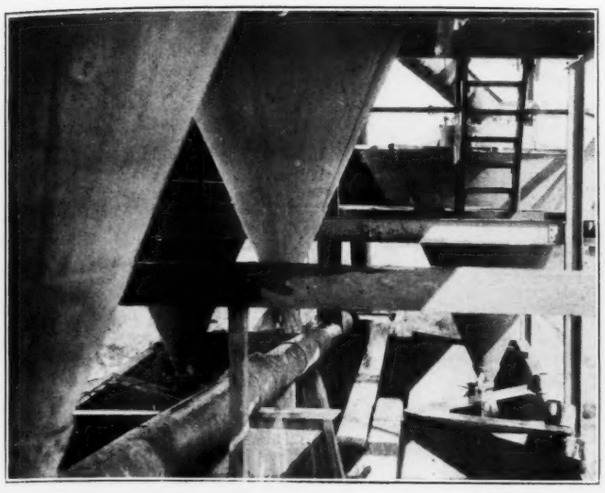
Dredge pump with stone-box in foreground

Berner 12-in. centrifugal pump which is direct-driven by a 300-hp. motor. The dredge pump is primed by a 6-in. Goulds centrifugal pump which is itself primed by a Goulds 4-in.-by-5-in. plunger pump. These are driven through Goodrich "Commander" belting by 5-hp. and 2-hp. motors respectively.

A stone trap, consisting of a steel plate box with a screen, intercepts all dirt and large stone before it can get into the pumps. One man controls all operations and has a clear view of both dredge and plant from his seat at the controls. Operations can be carried on all winter due to the fact that the dredge pond never freezes, being fed by warm springs which keep the temperature of the water above the freezing point. The interior of the dredge is kept comfortable by resistance coils which are located over the dredge pump.



View from top of new plant. New dredge at left, old dredge right



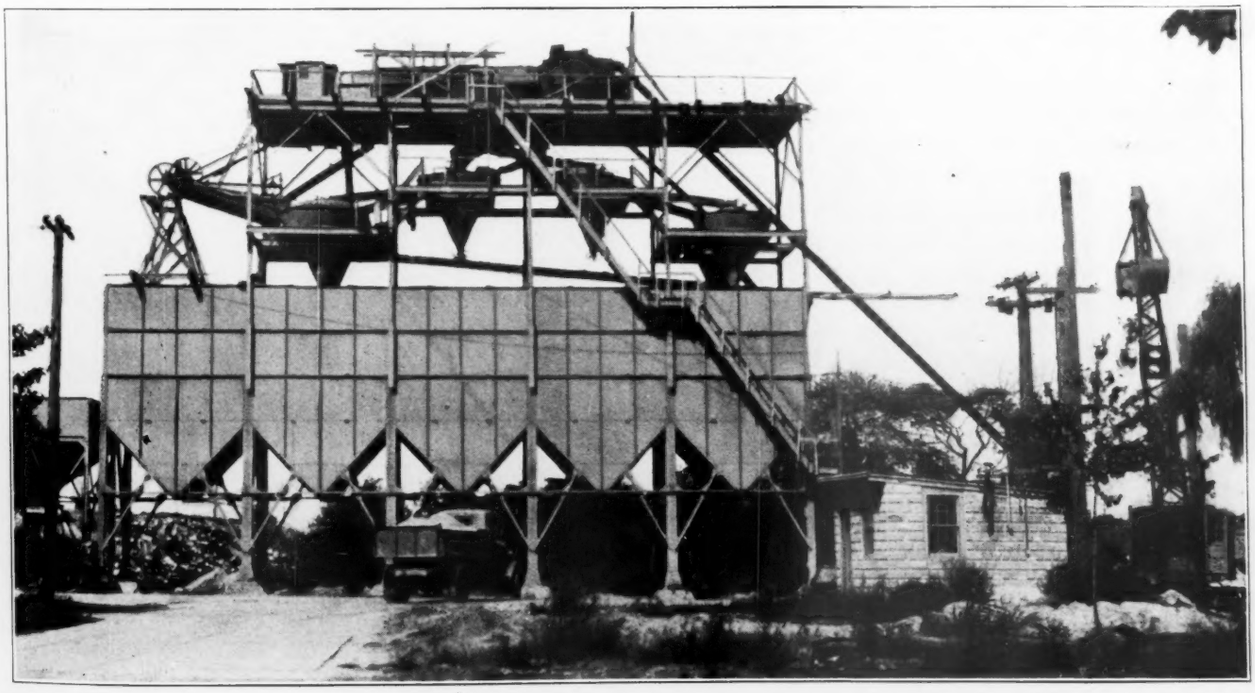
A few of the six sand cones in the new plant

Gravel washer in new plant

## The New Plant

The new plant is of the most modern design with concrete foundations and steel bins and superstructure. The pipe line from the dredge discharges onto a bar grizzly with 1½-in. spacing at the top of the plant. The oversize goes with the water into a rotary grizzly with 2⅛-in. perforations, the oversize here going with the water through a 12-in. steel pipe line to a waste-pile in an abandoned section of the pit. The material passing through both grizzlies goes to a 60-in. by 24-ft. Haiss revolving screen which has a 5/16-in. dust jacket and an 8-ft. scrubbing section. The screen main jacket has ¾-in. and 2⅛-in. perforations and is gear driven by a 30-hp. motor.

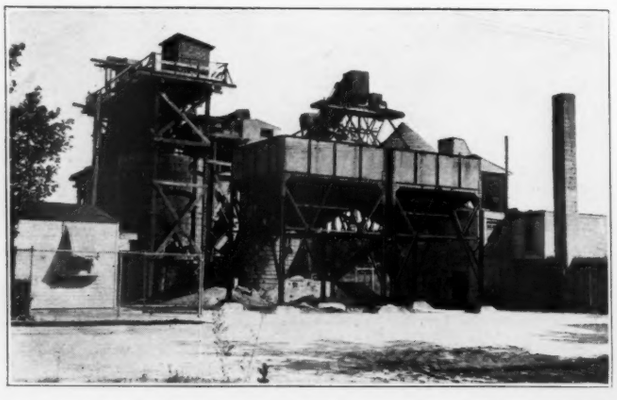
The gravel discharges directly into a Jeffrey gravel washer which drops the gravel into one of the five steel bins. This washer is driven by the same motor as the screen. The sand goes to six



New plant from south. Note compact design, which eliminates unnecessary rehandling of material. Small batcher bin at left. Crane which does stripping at right

**Front view of the old dredge**

8-ft. Allen sand cones, the first two producing coarse sand and the last four plastering sand. The five steel bins in the structure each have a 204 yd. capacity. A smaller-72 yd.-capacity bin alongside the others is kept filled with oversize which can be diverted from the grizzlies and for which



**Old plant, showing office (left), bins and block plant (right)**

there is an occasional call. The bins were all furnished by the Butler Bin Company. The plant has a capacity of 1,000 yd. per ten hour day.

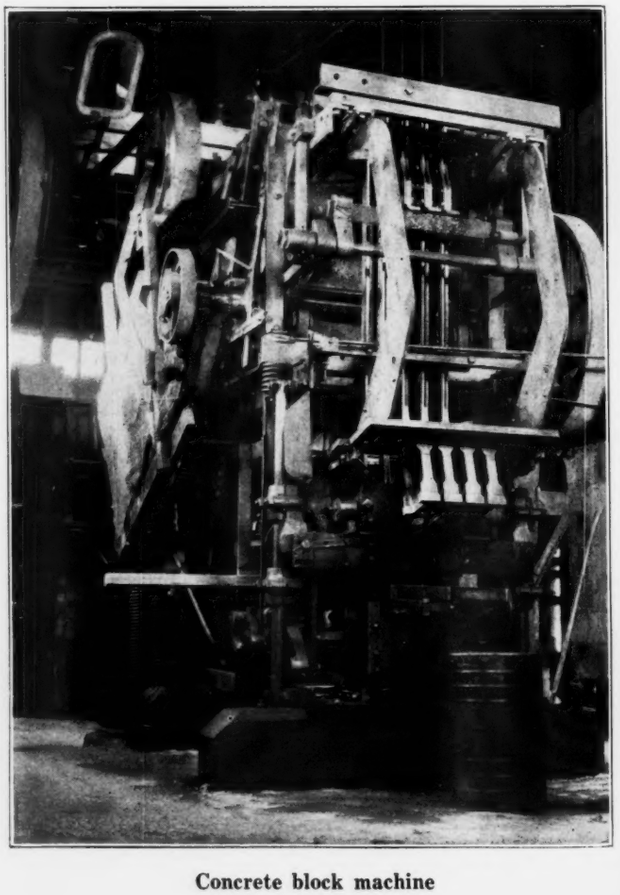
## The Older Operations

The original dredge is similar to the new dredge except that an 8-in. Morris dredge pump and a Clyde 3-drum hoist are used. The pipe line discharges to a Haiss rotary grizzly which feeds a 48-in. by 18-ft. Telsmith screen and four Telsmith sand settling tanks. The sized material is stored in two wooden silos. A Haiss conveyor feeds from the silos to two Butler 72-yd. capacity steel bins which load into trucks for distribution. This plant has a capacity of 500 yd. per day.

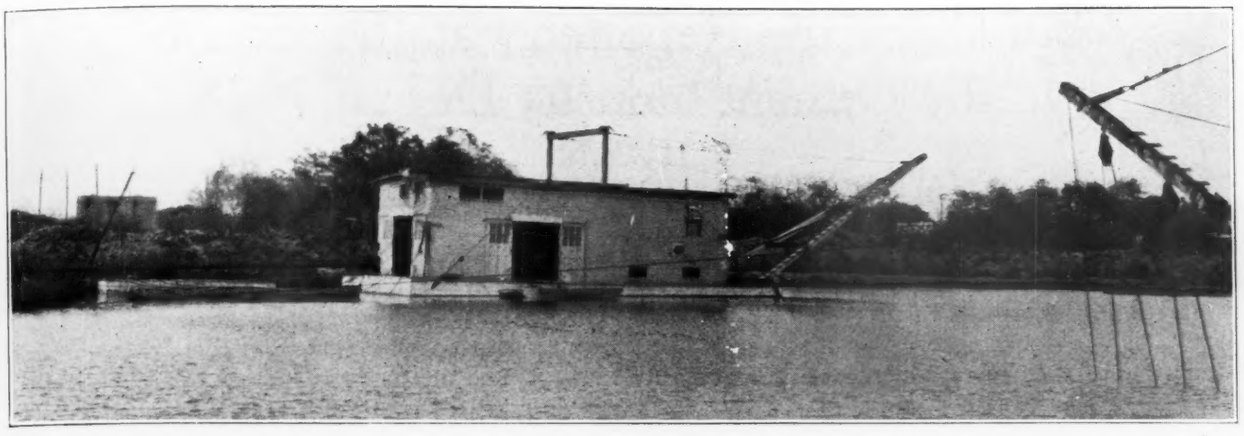
**Loaders handling humus**

## The Block Plant

Sand is conveyed from the old plant through a chute, belt conveyor and bucket elevator to a steel bin in the top of the block plant. This feeds a Kent block machine for making large sized block. The same bucket elevator through a swivel chute



**Concrete block machine**

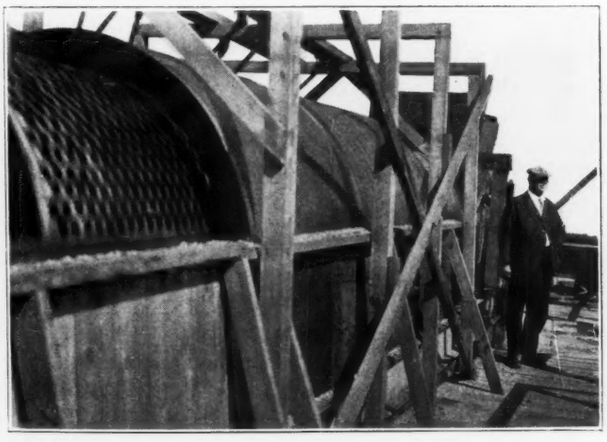


Side view of the new dredge

discharges into another hopper which feeds a Besser batch mixer. Cement is added here and the mixture fed to a Besser block machine which will make 8- by 16-in. and 12- by 8- by 16-in. block. The blocks from both machines are loaded onto cars and run into kilns where they are steam cured. The capacity of the block plant is 4,400 blocks per day.

### Miscellaneous

The humus is recovered from the piles by two Haiss stockpile loaders. These feed a Gruendler pulverizer carried on and driven by a Fordson tractor, which feeds onto a Portable Machinery Company portable conveyor. This discharges directly into trucks which haul the humus away for distribution.



Sizing screen in new plant. William Bonner at right

New plant from east. Crane in foreground

Deliveries of all materials are made in seven General Motors Corporation 5 ton trucks owned by the company. Additional trucks are hired when necessary. Concrete runways at both plants prevent delay in shipments due to weather. Roebling cable, Republic dredge sleeves, Crouse-Hinds conduit, Goodrich suction hose and Square D switches are used on both dredges.

The company office is maintained at the old plant. Wm. Bonner, who designed the new dredge and plant, is president. Richard L. Bonner is secretary and treasurer.

## Accidents in Quarrying Industry Reduced During 1928

A total of 119 employees were killed and 10,568 injured in the quarrying industry of the United States during the calendar year 1928, according to a statistical survey made by the United States Bureau of Mines, Department of Commerce. The death rate for the industry was reduced 10 per cent and the injury rate 20 per cent below the 1927 level, when 135 workers were killed and 13,459 injured.

In the quarrying industry 89,667 men were employed by 1,436 active operators. The number of men employed was 1,850 less than in the preceding year. A total of 24,397,377 man-days of labor was performed. The fatality rate per thousand 300-day workers was 1.46, while the injury rate was 129.95.

The quarrying of limestone required the services of the largest group of workers, 37,830; cement rock quarries employed 22,315; granite, 11,314; marble, 6,777; trap rock, 3,908; sandstone and bluestone, 3,849; and slate, 3,674. The highest accident rates were in the traprock group, in which 9 fatalities and 591 injuries occurred, the fatality and injury rates being 3.13 and 205.78 per thousand 300-day workers, respectively.

# Studies of the Reported Fatal Accidents In the Cement Industry During 1928*

By W. H. WEITKNECHT
Superintendent, Lehigh Portland Cement Co., Mitchell, Ind.

IN PRESENTING an analysis of the fatal and of some permanent disability accidents which occurred in the cement industry during the year 1928, I have not attempted to tabulate, classify or group them for comparative study. That information is very completely given in the last May-June issue of the "Accident Prevention Magazine," published by the Portland Cement Association. A brief reference to some of the figures in that report will suffice for this study.

The total number of *lost-time* accidents reported for the years 1920 to 1924 inclusive are as follows: for 1920—2,615; for 1921—2,646; for 1922—2,572; for 1923—3,197; for 1924—3,058. For the years 1925 to 1928 inclusive the report is as follows: for 1925—2,602; for 1926—2,221; for 1927—1,379; for 1928—913.

During the latter four years the total actual number of *days lost* from accidents were as follows:

48,565 during the year 1925.
44,181 during the year 1926.
32,490 during the year 1927.
27,989 during the year 1928.

The number of fatal accidents decreased as follows:

In 1925—61 fatalities occurred.
In 1926—45 fatalities occurred.
In 1927—30 fatalities occurred.
In 1928—33 fatalities occurred.

The permanent disabilities record the high figure of 83 in 1923, followed by 76 in 1924, 78 in 1925, 67 in 1926, 67 in 1927 and 74 in 1928.

It will be observed from these figures that the reduction in the number of fatal accidents is fairly comparable with the reduction in the actual number of days lost. The reduction in the total number of disabilities, however, is not as favorable, while the average number of days lost per accident increased as follows:

In 1925 average number of days lost per accident was 18.6.
In 1926 average number of days lost per accident was 19.9.
In 1927 average number of days lost per accident was 23.5.
In 1928 average number of days lost per accident was 30.7.

The foregoing figures apparently indicate a distinct improvement in accident prevention work in the cement industry during the last four years. We have accomplished a great deal, as the records tend to prove, but I question whether the bare record alone tells the correct story. There are indications that it does not.

I think it will be admitted without question that the Portland Cement Association's annual "Trophy Award" for the best accident prevention record in the industry has produced a greater interest and has brought about a larger reduction in the number of lost-time accidents than any other one thing. This interest, amounting to competition among the operating organizations, has likewise challenged the attention of most of the executives in the industry, and has, therefore, become the most important factor in establishing accident prevention work in the industry on its present sound basis. Certainly a worth-while accomplishment.

But we cannot measure the effectiveness of this accident prevention work by the reduction in the number of lost-time accidents, for prior to this intense competitive interest there was a great deal of time charged to *lost-time* accidents when, in reality, an accident resulting in a very minor injury furnished the basis for a brief vacation to the employee so injured. These vacation periods previously charged to *lost-time* accidents have, in most operating organizations, disappeared, and a lost-time accident now is legitimately a *lost-time* accident. There is even danger that in our enthusiasm to establish a record we may step a little across the line on the other side. The real measure of accident prevention work is the reduction in fatalities and in the serious personal injury accidents resulting in permanent disabilities or long periods of temporary disability. After all, it is not the occasional *no accident* record that counts but the permanent improvement.

The fatality and permanent disability record for 1928 shows an increase in both classes from the preceding year, notwithstanding the reduction in man hours worked from approximately 93,800,000 to 85,800,000 man hours. To make a study to ascertain, if possible, the reason for this increase and report at this time is the purpose of this paper.

In this connection let me say that none of the reports submitted for study contain either the name of the company at whose plant the accident occurred, or the name of the injured party, or any other information to indicate the source of the report.

I shall, at the outset, state the conclusion as a sort of a proposition, and then endeavor to prove it from the records. I do not believe that the increase in the number of serious and fatal injuries which occurred in the cement industry during 1928 and those which have thus far occurred during 1929 indicate a general reaction or slump following

* Paper presented before the Quarry Section of the Eighteenth Annual Safety Congress.

a period of intensive accident prevention effort, but rather that the much smaller number of these accidents during the year 1927 and the but slightly increased number for the year 1928 was coincidental with and not the result of that effort. The much larger number of fatalities thus far reported for 1929 when, during the same period, the number of plants reporting *no lost-time* accidents to date is larger than ever, tends to confirm the belief already expressed.

Nor do I believe that the years 1927 and 1928 record the best results that may reasonably be expected in the cement industry.

I believe, and am bold enough to go on record here and now to predict, that the cement industry will some day celebrate a *no fatality year,* for the analysis of the 1928 fatal accident reports clearly indicate, if it doesn't actually prove, that this possibility should have been a near reality for last year, so far as preventable, reasonably preventable accidents, were concerned—if the supervisory management, that is, the operating management from general manager and superintendent to the department foreman and sub-foreman, had been as competent and as efficient in their supervision of method and practice as they reasonably ought to have been.

The criticism of accident reports which follows is intended to be constructive and to stimulate more thorough accident prevention, with correspondingly fuller and more correct reports of each accident. It is seldom that the real cause of the accident is given in the reports. In most cases it must be inferred from very incomplete descriptions of the accidents, and the inferences which follow are only suggestive, and cover but a few of the inquiries and suggestions that might be made from the nature of the different accidents as reported.

## The Fatalities as Reported

Following are the reported fatalities occurring during 1928 with assigned causes for the accidents and comments thereon:

**Report A**—American, age 21, length of service two weeks. Occupation—Construction laborer. Location—Under No. 1 kiln.

Assigned cause of accident—"Took hold of wire which was in contact with a live wire."

**Comment:** What had occurred to bring this wire in contact with the live wire? Was the charged condition of the wire known and had reasonable safeguards been installed? Had the man been warned of this danger and did he forget? The report contains no information to infer the real cause of the accident. It would appear that the cause of the accident was either carelessness or, what is more likely, improper supervision.

**Report B**—Polish American, age 53, length of service six and one-half years. Occupation—Raw mixer. Location—Pulley driving raw elevators and conveyors.

Assigned cause of the accident—"Using iron bar to scrape belt dressing off pulley while in motion. Bar caught by belt, striking injured in abdomen."

Nature of injury—"Puncture of lower bowel, left side—peritonitis."

**Comment:** The long period of time employed and the accident suggests a serious charge against incompetent supervision as the cause of this accident. As a first offense of a new employee it might be chargeable to insufficient instruction or violation of instructions. The report shows the man at his "regular occupation" and it is reasonable to infer that this employee had been working in this department for a sufficient length of time to be warned against such dangerous practice. A reasonable inference would be that improper supervision was the cause of the accident.

**Report C**—Italian, age 47. Report shows accident occurring on date of employment. Occupation—Coal miller. Location—Inside coal house elevator shaft.

Assigned cause of accident—"Struck by coal elevator while inspecting for repairs."

Nature of injury—"Fractured skull and fracture of right arm."

**Comment:** It would appear that there was an attempted inspection of the elevator while in operation, which suggests improper instructions or a violation of instructions. However, carelessness, depending on circumstances, might also have been the cause of the accident."

**Report D**—American, age 29, in service 11 years. Occupation — Switchboard operator. Location — Back of switchboard in power house.

Assigned cause of accident—"While attempting to insulate exposed nut on 6,600 volt pothead worker's hand evidently came into contact with pothead terminal and either grounded or short-circuited same, the current passing through the body.

**Comment:** Further details of this accident report that the electrician was installing new potheads back of switchboard when the switchboard operator felt that the electrician was in danger of coming into contact with high voltage circuit and went back of switchboard to insulate an exposed point of danger.

This accident suggests a wrong diagnosis by an expert consulting physician. Incompetence cannot be assigned as the accident. Hardly carelessness. Misdirected judgment on the part of an experienced employee was the cause of this fatality.

**Report E**—Crotian, age 40, length of service not given. Regular occupation—Yard laborer. Location—Crusher.

Assigned cause of accident—"Was opening knuckle on rock car and car was bumped from rear. Car struck him and crushed side of face and chest."

**Comment:** The accident and the nature of the injury are given as the cause of the accident, when it is evident that the cause of the accident must lie in the bumping of the car. Carelessness on the part of some one other than the injured party is the probable cause. If the clearance between the cars is insufficient defective equipment may be the principal cause.

**Report F**—American, age 27, in service one and one-half months. Occupation—Oiler. Location—Tube mill room.

Assigned cause of the accident—"To the best of our knowledge this man fell asleep and either leaned against tube mill or sat down and leaned back and when electric horn was sounded several times apparently did not hear it, and mill was started. A belt caught his clothes and threw him around between buttment and mill."

Nature of injury—"Badly mangled."

**Comment:** "The report gives the working hours of this man—13 hrs. nights. The accident occurred at 2:00 a. m. If the man fell asleep as suggested, carelessness, induced by fatigue or mental incapacity to comprehend danger could be assigned as cause of this accident.

**Report F-2**—Negro, age 34, in service six months. Regular occupation—Tank man. Location—Fire clay tank.

Assigned cause of accident—"Deceased and fellow-employee were punching in fire clay tank to make it feed. When fire clay started to feed fellow-employee left deceased, returning in about 15 minutes to find him missing."

Nature of injury—"Dead when found."

**Comment:** The accident is readily inferred from the description. If proper safeguards were provided or a safety belt at hand carelessness or failure to heed instructions should be assigned as the cause of the accident. If no such provision or protection was furnished the cause of the accident should be charged to insufficient guarding or insufficient protection.

**Report G**—Polish deckhand, age 20, period of employment not given. Location—Tugging boat adjacent to dredge.

Assigned cause of accident—"Fell from deck of tugging boat into water and drowned."

**Comment:** Evidently no witnesses. The falling from the deck of the boat constituted the accident, which resulted in drowning. What were the duties of the man on the boat that exposed him to this hazard? Did he sustain an injury that caused the fall? Was he under the influence of drink? The report contains no information to indicate the origin of the accident.

**Report H**—Portuguese, age 37 years. Occupation—Oiler; in service 2 years. Location—On railroad track between stock houses.

Assigned cause of accident—"Came down to first floor to get electric globe, ran down platform steps just as repairman started to pull empty car into loading position and was hit by cable. Repairman yelled and stopped tugger. Deceased freed himself and instead of returning to platform laughed and ran between loaded car and empty car moving from momentum of pull, realized his danger and attempted to return back, was caught between bumpers and crushed."

**Comment:** The report gives a good description of the accident but leaves the cause to be inferred. This man was evidently too much in a hurry. Was he running away from someone or was he just one of those happy-go-lucky fellows who in this case was happy but not lucky? In this case he was not looking where he was going, perhaps just careless or it may have been the fatal ending of a little horse play. These are speculative inferences in the absence of specific information to show the real cause.

**Report I**—Italian, age 39 years, in service eight years. Occupation—Williams mill operator. Location—Mill room.

Assigned cause of accident—"Apparently got caught between his air hose and shaft between mill and motor. Clothing torn off and when he got free he fell or was thrown on steel hammers on the floor of the mill."

Nature of injury—"Body badly bruised and probable fractured skull."

**Comment:** The description of the accident and failure to report witnesses indicates no witnesses were present. An efficient guard in place is reported indicating that the work was not done in the usual or proper manner rendering the guard ineffective. As the accident happened at 10:55 p. m., was the condition of light sufficient for safety? The report does not show. What was done, if anything, to prevent the recurrence of a similar accident? This would suggest the cause.

**Report J**—Quarry laborer, age 32 years. Report shows accident occurring on date of employment. Location—Electric shovel in quarry yard.

Assigned cause of accident—"While lifting door over hoisting cable on No. 7 electric crane man's leg got caught between gears and frame of crane."

Nature of injury—"Severe laceration of muscles, nerves and blood vessels of upper right thigh."

**Comment:** The occurrence of the accident 15 minutes after employment began would at once suggest insufficient instruction but the more probable cause is the absence of proper guard not mentioned in the report. Was the shovel operator responsible for starting the shovel before or when this door was lifted? The absence of a needed guard or improper supervision is the probable cause.

**Report L**—American, age 30 years, in service one year. Occupation—Motor inspector. Location

—Hammer mill elevator compensator. Assigned cause of accident—"No details. Witnesses, none reported."

**Report M**—Austrian, age 53, in service 22 —— Location—Cement storage bins.

Description of accident: Rather lengthy and complete. In substance as follows: "The man was employed on a dragging machine to drag cement from pack house bins. Foreman had just made inspection and found all screw conveyors covers in place, gave instructions to start and returned to packing house. When flow of cement did not appear in about 10 minutes the foreman returned and found man in screw conveyor with conveyor cover removed to a place about five feet from conveyor pit."

**Comment:** No doubt the cause of this accident was disobedience of instructions. Considering the extreme hazard of screw conveyors defective equipment is also suggested as a contributing cause. It would appear that the conveyor cover was too easily removed by one man. Grating guards installed under the conveyor cover should make recurrence of a similar accident improbable.

**Report N**—Crusher foreman, age 37 years, in service three years, six months. "Description of the accident indicates that the foreman was thrown from the car into the crusher."

**Report O**—Drill helper, age 23 years, in service 28 days. Reporting condition of light, dark where accident happened. Assigned cause of accident—"Deceased was killed by a slab of rock which fell on him off ceiling in pigeon hole of No. 8 tunnel."

**Comment:** Insufficient inspection and insufficient supervision are the probable causes of the accident. The unlighted condition of the place no doubt contributed largely to the insufficient inspection.

**Report P**—Laborer, age 21 years, length of service not given. Location—Dryer storage bins.

Assigned cause of accident—"He was keeping raw material broken down and feeding same through hopper into dryers but somehow was caught in a slide and was buried."

Nature of injury: "Suffocated when body was recovered shortly afterwards."

**Comment:** The responsibility assigned is none. It reports an efficient guard installed and the guard in place. Assuming that the guard as installed was efficient the cause of the accident must lie in a failure to obey instructions. Was a safety belt provided? If not, insufficient protection was the probable cause of the accident.

**Report Q**—Reports a fatality to a well drill operator in service 16 years and engaged in loading explosives.

Description of the accident: "Injured was engaged in loading blast holes. Half a case of 60 per cent dynamite had been loaded in one hole when hole became blocked by a piece of rock 35 feet down. Unsuccessful attempts were made to clear the hole. When loading with 50 per cent dynamite was commenced, because being more granular, it will pass through a small opening more readily. About three-quarters of a case of 50 per cent dynamite had been loaded and an extension light (110 volt on cap-tire cable) was lowered in hole to make observation. As nearly as could be estimated this light was about 15 feet from top of hole when explosion occurred. Injured was sitting on empty dynamite case between hole and quarry face about 12 feet away. He was thrown on to the quarry floor about 50 feet below and fatally injured. No blasting caps or detonators in the hole. The explosion may have been caused by tamping powder or may have resulted from use of light in hole or from some other cause. Our opinion is that using light was the cause of the accident. We would suggest that under no circumstances should electric lights be lowered into a hole containing explosives."

**Comment:** The description of the accident contains the probable cause of it and could be described as improper methods of loading blast holes.

**Report R**—Italian, age 41 years, in service three years. Occupation—Driller. Location—West side of quarry near No. 2 shovel.

Assigned cause of accident: "Barring down rock on face of No. 2 shovel caused a slide of stone to come down which buried him under the stone."

Nature of injury: "Compound fracture of left ankle, crushed pelvis and internal injuries."

**Comment:** This is always an unsafe practice and should be done under the most careful supervision. Insufficient or incompetent supervision was the probable cause.

**Report S**—American, age 30 years, in service three months. Occupation—Tube blower. Location—Power department, waste heat boiler.

Assigned cause of accident: "Unknown, no witnesses. Conveyor is properly protected with covers which fit in slotted grooves. Top of conveyor is two feet above floor level and duties of this employee did not require his stepping onto or crossing over it. Workmen attracted by his cries found him with lower left limb caught in same with machinery running and his body partly supported by this section of conveyor cover."

Nature of injury: "Left leg severed above knee and upper part of limb mangled."

**Comment:** No conveyor is properly protected if covers are readily removable. Conveyor covers should be bolted in place. Wherever possible grating guards should be installed beneath tight removable covers. From a safety standpoint screw conveyors are defective equipment if the covers are readily removable, leaving the screws exposed.

**Report T**—American (Negro), laborer, age 35 years, in service 15 years.

Assigned cause of accident: "While drawing coal from storage, employee walked over pile which was undermined and it caved in with him covering him up. Unless this was very unusual occurrence it would seem that carelessness, failure to obey instruction or improper supervision was the cause of the accident, as prohibiting instructions should be enforced if arching was known to occur."

**Report U**—American, age 30 years, in service 10 years. Occupation—Electrician.

Assigned cause of accident: "Injured was watching men start kiln after repairs. Kiln back-fired."

Nature of injury: "Serious burns covering body. This same accident caused similar serious injuries to the general foreman, 18 years in service, the kiln foreman, 22 years in service, and a burner 25 years in service."

**Comment:** In view of the responsibility and the long time experience of all of the injured parties and in the absence of fuller report, no suggestion is offered as the cause of the accident as the occurrence was evidently a most unusual one.

**Report V**—Reports a fatality to an erector as follows:

"We are told that he was assisting to place a wooden gate block on a cable that had been swung from the structure above at No. 4 burner building and that he moved into a position too close to one of the high tension lines of the dust collector system, received a shock and fell a distance of about 57 feet to the concrete floor of the building."

Nature of the injury: "Fracture of skull and left femur."

**Comment:** "Carelessness, insufficient instruction and improper supervision are indicated.

**Report W**—American, age 38 years. Position—Superintendent.

Assigned cause of accident—"Stepping from railroad grade across gap to projecting timber on concrete form, misfooting and feel a distance of about 15 feet to concrete floor below, landing on head and shoulders sustaining fractured skull."

**Comment:** Accidents are no respecters of persons. They deal with cause and effect only. The same chance taking or carelessness that causes an accident to a laborer produces the same result for the superintendent as happened in this case.

**Report X**—Slovak, age 36 years, in service eight years. Occupation—Steam shovel crane man.

Assigned cause of accidents: "Stone rolled out of side of bank near top and hit him on head just as he had stepped from steam shovel."

Nature of injury: "Multiple lacerations of scalp and fracture at base of skull."

**Comment:** Carelessness or insufficient supervision is the cause of the undue exposure so near an evidently high ledge. Could not the same purpose have been served by stepping off on the other side of the steam shovel? Did his duties require him to be in this position? Would more frequent inspection have avoided the accident?

**Report Y**—Italian laborer, age 38 years, in service eight years.

Nature of accident: "The report describing the accident is lengthy and very complete, in substance as follows: The party and another employee were employed to poke material down through feeders as it arched when being placed over hopper by gasoline shovels. Safety belts had been provided with instructions from the foreman to wear them at all times when working on this job. For some unknown reason the man started to walk across the material which had arched over No. 4 hopper when the material gave way beneath him permitting him to fall through and the material caved in on top of him. He did not wear the safety belt at the time."

**Comment:** Carelessness and failure to obey instructions was the evident cause of the accident.

**Report Z**—American, age 30 years, in service two years eight months. Occupation—Packing house repairman. Location—Loading platform.

Assigned cause of accident: "Loading crew were moving up car after loading. Injured tried to go between loading chute and open car door to get to other side of chute, failed to make it and became caught between chute and side of car."

Nature of injury: "Severely crushed and bruised. Death resulted nine days following."

**Comment:** If this man's act was exceptional, carelessness and taking a chance constitute the cause of this accident. If it was a rather common practice the packing house foreman should have observed it and prohibited it. Failure to do so would make incompetent supervision the cause of the accident.

**Report AA**—Polish laborer, age 38, employed in yards.

Assigned cause of accident: "While electric crane was unloading clinker car, injured climbed up and sat on crane base to rest. Operator not knowing he was there swung crane around and caught him between base and crane body, resulting in crushing injured to pelvic region. The length of service of this employee covered the brief period of 18 days."

**Comment:** If his duties were in connection with the operation of the crane insufficient instruction may have been the cause of the accident. It is probable that his duties were of a different character and that carelessness as a result of mental incapacity to realize the danger was the basic cause.

## Personal Injury Accident Cases Reported

**Report A-2**—Report of a serious injury to a construction laborer. Time lost—398 days; length of service, three months.

Assigned cause of accident: "Cleaning up under cooler, carrying out jacks when jack slipped and

hit his arm." Nature of injury: "Bone dislocated at left elbow."

**Comment:** The unexpected occurrence was the slipping of the jack. It constitutes the accident. No cause is assigned for it. Was the accident due to a lack of reasonable care on the part of the injured party, in which case carelessness should be assigned as the cause. Was the jack too heavy and were proper facilities provided for its removal? The information on the report is incomplete.

The long period of disability suggests a more serious injury than dislocation.

**Report A-3**—Report of a serious injury to a construction laborer in service eight months. Disability 192 days.

Assigned cause of accident: "Tearing down coal elevator and fell backwards from elevator about 15 feet." Nature of injury: "Fracture of bone in the back."

**Comment:** The fall from the elevator constitutes the accident, for which no cause is assigned. The man was a laborer on construction, which suggests the probability that the man was incompetent for this class of work. Was proper scaffolding or other protection provided? In the absence of sufficient information to prove carelessness, the nature of the accident points to insufficient supervision as the cause of the accident.

**Report B-2**—Reports a serious injury to an employee in service 4¾ years. Occupation—Dust collector; time lost not reported.

Assigned cause of accident: "Putting potash in conveyor, stepped on conveyor cover at hanger and right foot slipped through guard." Nature of injury: "Contusions and abrasions right ankle."

**Comment:** The right foot slipping through the guard constitutes the accident which resulted in the injury as reported. The real cause evidently was an improper or insufficient guard.

**Report B-3**—Reports a serious injury to kiln oiler in service 5 years; time lost—not reported.

Assigned cause of accident: "Coal feed screw choked; while reaching for rod to poke coal down through, coal going into kiln exploded, causing backfire from kiln." Nature of injury: "Burns on face and left arm."

**Comment:** The inference is that the flow of coal was temporarily interrupted by the choking of the feed screw. The choking of the coal feed screw was the beginning of this accident and its cause must be sought in this section. With a rod at hand for unchoking it, it is evident that this trouble was common and suggests as the cause of the accident a defective feed screw or other equipment to which the coal from the screw was being delivered.

**Report E-2**—Reports an injury to a grinder, length of service not given; days lost—57.

Assigned cause of accident: "Working in coal mill when dust fell in salamander, causing explosion; explosion set clothes on fire, burning face, hands and body."

**Comment:** Poor or negligent supervision is indicated when an open fire of any kind is permitted in a coal mill.

**Report F-3**—Reports an injury to a locomotive brakeman, in service 13 months. Time lost—8 days.

Assigned cause of accident: "In making coupling between two small rock cars somehow got head in between the two cars and had head squeezed before he could withdraw it."

Nature of injury: "Bruise on right side of head. Cut on left side."

**Comment:** The description of the accident suggests improper equipment as the cause. The clearance between cars should be sufficient to afford full protection while coupling cars.

**Report F-4**—Reports an injury to a locomotive engineer, in service 19 months. Days lost—20.

Assigned cause of accident: "Engine crew were making a flying switch, and as engine cut loose from loaded coal car it derailed a few feet further on and "slewed" across track; loaded coal car following struck engineer's side of cab and tore it off." Nature of injury: "Left leg badly bruised and wrenched at knee."

**Comment:** What caused the derailment of the locomotive? The report does not indicate. Was it spreading rails and low joint or any one of a number of things that might have occasioned the derailment? Whatever it was, the cause of derailment was the cause of the accident.

**Report J-3**—Reports fall to foreman, in service 19 years.

Assigned cause of accident: "While passing through raw mill foreman tripped over a scraper lying on floor, striking his knee on concrete. Scraper in use at the time."

Nature of injury: "Fracture of the right patella with separation of the fragments." Reporting time lost—102 days.

**Comment:** The report should probably read scraper not in use at the time, since it was lying on the floor when it became the cause of the accident. Was the light condition poor? Was the foreman's eyesight defective or was it carelessness on the part of the employee who had been using the scraper in leaving it lie on the floor in a position where it became the tripping object?

**Report L-3**—Reports an accident to a coal crusher operator. In service five months.

Assigned cause of accident: "Employee was trying to remove lump which had caught in conveyor over coal crusher when he got his arm between belt and pulley.

Nature of injury: "Bad laceration of arm at elbow." Time lost, not reported.

**Comment:** Violation of instruction is the probable cause of this accident. If this trouble occurs frequently, defective equipment and failure to install proper guard should be assigned as the cause of the accident.

**Report O-2**—Reports an injury to locomotive brakeman in service two months.

Assigned cause of accident: "Injured brakeman neglected to close switch and gasoline locomotive coming in on main line bumped into electric locomotive pushing electric locomotive forward against loaded rock cars. Injured was standing on front of electric locomotive when locomotive bumped against cars. His foot was caught between draw head of rock car and bumper of electric locomotive."

Nature of injury: "Mangled left foot, compound fracture of metatarsal bones, open wound from ankle to great toe." Lost time—74 days.

**Comment:** The description of the injury appears to furnish the correct cause of the accident, which was neglect on the part of the brakeman injured.

**Report P-2**—Reports the injury to a laborer in service nine months as follows:

Assigned cause of the accident: "Injured and another man dismantling a scaffold were standing on the footboards, pried loose the headers supporting same and consequently they fell with the footboards."

Nature of injury: "Small bone in right foot fractured near ankle." Time lost—94 days.

**Comment:** This appears to be a case of sitting on a limb and sawing it off at the wrong end. Incompetence for the work which suggest improper supervision should be assigned as the cause.

**Report P-4**—Reports an accident to a car sweeper in service nine months.

Assigned cause of accident: "He was helping sweep cars and placing bags at the machine for the packers and noticed a bag of cement running off the belt into car. He endeavored to shove back on and fingers got caught in a small drive chain that operated a live roller."

Nature of injury: "First three fingers of right hand injured at distal joint, and were amputated later by doctor." Time lost—62 days.

**Comment:** One of those well intentioned careless acts that it is difficult to prevent. It is a common occurrence for bags to be deposited on the side of the carrying belt; proper guides should be installed and the drive chain guarded and defective and unguarded machinery would be the cause.

**Report V-2**—Reports a slight injury to a laborer engaged in breaking concrete in burner building and that a piece of concrete struck him on the left hand.

Nature of injury: "Sustained an abrasion one-half inch in diameter on the back of the middle finger of the left hand. It became infected and required amputation."

**Comment:** Assuming that reasonable care was exercised the accident was slight and probably unpreventable. The serious consequences resulting in permanent disability were no doubt due to lack of first aid and timely medical attention.

The intent of the foregoing brief review of these accident reports is to point out the difference between the assigned causes and the possible or probable real causes, for it is only as the real causes become known that the responsibility appears. It is evident that a larger number of the more serious accidents, including the fatal ones which occurred during 1928, are due more to incompetent and to insufficient supervision than appears in the reports.

To what else can be attributed those fatalities, disabilities and serious injuries which result from scraping belt dressing off pulleys or belts while in operation; the improper starting of rotary kilns, causing explosions of violent intensity; the crushing of persons between cars having insufficient clearance; maintaining open fires in coal houses, and other extra hazardous practices or place hazards which always contain not only possibilities but large probabilities of major accidents?

Accident investigations to ascertain the proper causes of accidents is the first essential in preventing their recurrence. It is the diagnosis of accident prevention. It is commonly accepted that a physician's most important service in any given case is the correct diagnosis of the ailment. The treatment may vary somewhat as the conditions and responsiveness of the patient may indicate, but correct diagnosis is the essential. Let me carry this analogy a step farther. It is becoming more and more the custom that persons consult their physician at the first suggestive indication of an ailment, to ward off a possible resulting illness. What about investigating those accidents, many of them of the major class, which do not result in injuries but contain all the possibilities of them?

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## "Cement and Concrete"

With the above as its main title and with "a general reference book, 1929" as its subtitle a booklet of 64 pages has been published by the Portland Cement Association.

The contents of the booklet verify the statements made on page 1 that this is "a compendium of useful information, drawn from authoritative sources, on the cement industry, the manufacture of portland cement, uses of the product in concrete, concrete highways and related data, and the Portland Cement Association." Glancing through the index one will find that discussion is given to such items as composition of cement, tall concrete chimneys, production of Haydite, athletic stadia, federal aid for highways, researches, locations of American cement plants, safety, color in concrete, and winter construction.

# Silica Sand Producer Uses Modern Methods and Supplies a Full-Time Market

## Silica White Sand Co. of Festus, Mo., Maintains High Degree of Efficiency In Both Open Pit and Underground Operations

By CARL LIBERG

A SILICA sand company producing 50 tons of screened sand per man shift and operating continuously throughout the year may be found on U. S. Highway No. 61, one mile north of Festus and 30 miles south of St. Louis, Mo. Ingenious planning, coupled with a careful study of modern practices in mining and quarrying, have made it possible for the Silica White Sand Co. to produce with a small crew of 10 men working only one eight-hour shift per day a constant daily output of 500 tons of screened silica sand. In addition to being one of the largest silica sand producers in the state, the plant has the distinction of producing material of excellent quality, analyses showing an average silica content of 99.9 per cent with alumina as the only impurity.

From the time of the opening of the plant in 1916 until four years ago, all mining operations were conducted in open pits. However, because of the expense involved in removing an overburden of seven feet of rock and clay and because of the difficulties encountered in separating out clay material which affected the quality of the shipped product, it was found advisable to open a tunnel into the vast deposit of silica sand and to use modern mining methods in extracting the material. As a result the company today operates both an open pit and an underground mine and has found that this system increases to a marked degree the general plant efficiency since it allows a quick and easy interchange between open pit and mine operations. In the event of a breakdown of important equipment in either working place little time is lost, for it is but a matter of a few minutes for the men to move into the pit or mine, as the case may be, and there resume operations. Also, during periods of inclement weather, when working conditions in the pit are far from ideal, mine operations may continue with no discomfort to the workers.

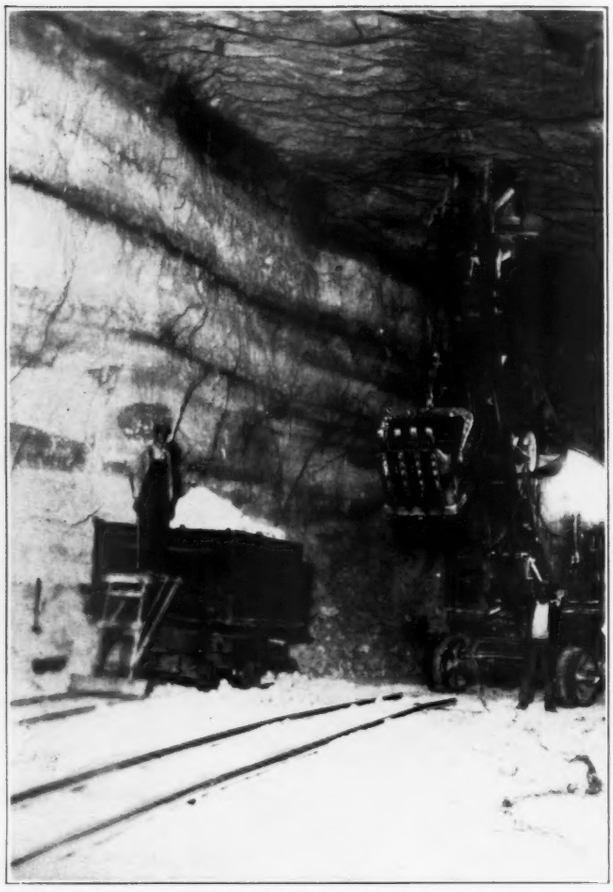
### Mine Operations and Equipment

A tunnel 38 ft. high and 40 ft. wide has been driven into the stratum of silica sand for a distance of approximately 600 feet. Two drillers using a Denver Rock Drill and a type R 39 Ingersoll Jackhamer, drill three sets of matched breast holes in the upper portion of the face of the tunnel and shoot out a 12-ft. ledge. Mining is then continued by use of a "snake-holing" method which minimizes powder consumption as well as drilled footage. Atlas 40 per cent dynamite is used in both the pit and underground work.

Screening and loading building

Compressor equipment includes a Curtiss double cylinder 8-in. by 8-in. compressor of the vertical type with a capacity of 110 cu. ft. per minute and a 9-in. by 8-in. double action horizontal type Pennsylvania with a rating of 188 cu. ft. per minute. The Curtiss compressor is driven by a 20 hp. G. E. motor; the Pennsylvania by a 35 hp. Robbins motor. Duplication of this equipment allows continued operation in the event of either compressor or motor trouble. The main receiving tank is in size 6-ft. by 8-ft. and is located at the compressor building, while a 3-ft. by 6-ft. receiver maintains a pressure of 110 pounds in the mine. Drills are sharpened in a Denver drill sharpener and a small forge and miscellaneous blacksmith's tools enable the operators to save time by making small repairs on the property.

A shovel operator and two lump breakers, one stationed ahead of the shovel and one in the car being loaded, make up the loading crew. Loading speed is enhanced by the use of two home-made 8-ton, side dump tram cars, into which a Thew trac-



**Shovel at breast of tunnel. Note wooden platform on end of boom to permit inspection of roof**

tor-mounted electric shovel deposits the silica sand from its ¾-yd. bucket. Flanges, welded to the sides of the tractor wheels, make possible the use of rails and expedite the movements of the shovel to and from the working face.

## The Open Pit

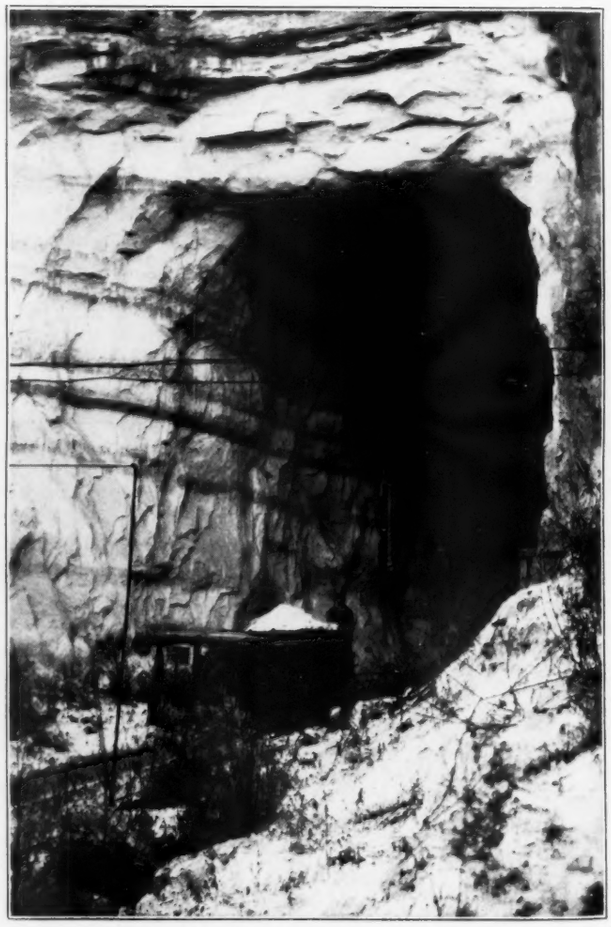
The removal of an overburden of some 7 feet of rock has been one of the big problems in the open pit operations of the Silica White Sand Co. Early in the history of the company it was found necessary to plan operations in such a manner that the cost of removing this rock would not be prohibitive. This was done by mining the sand in long narrow pits approximately 40 ft. in width. Upon reaching the end of the deposit another cut, parallel to the first, was made, the overburden being dumped into the pit previously abandoned. This simple method of handling the overburden has resulted in material savings in both time and money.

Operations in the open pit are very similar to those conducted in the tunnel workings. Another Thew tractor-mounted electric shovel having a ⅝-yd. bucket, loads material into the tram cars mentioned in connection with underground operations. Drilling is done with the same equipment as is used in the tunnel and compressed air is obtained from the same compressors.

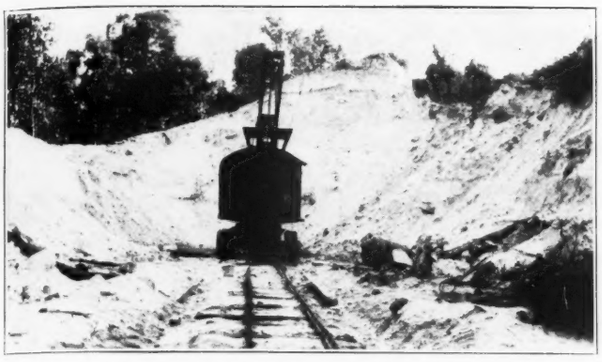
## Screening Plant

A 3½-ton gasoline locomotive hauls the loaded tram cars from the pit or mine to the screening plant. Here again duplication of important equipment permits of uninterrupted haulage. Two 3½-ton locomotives, a Whitcomb and an American, are maintained, one being kept in reserve for emergency use. Two men, a driver and car-hooker, make up the haulage crew.

A 500-ft. haul over narrow gauge tracks brings the material to the screening plant, located on a one-mile spur of the Missouri Pacific Railroad, where it is dumped into a hopper leading into a 12-ft. by 3½-ft. Stevens-Adamson trunnion type screen, in which it is rotated until it is fine enough to pass through the ¾-in. screen openings. A Stevens-Adamson conveyor equipped with a 30-in. belt, manufactured by the Day Rubber Co., travels under the cylindrical screen and carries the discharge to a 3-ft. by 6-ft. single deck Universal vibratory screen mounted on a platform directly over the spur track. Material passing through the ¼-in. openings in this screen drops into a gondola car spotted below and is ready for shipment. Oversize, consisting principally of small, extra-hard lumps, is chuted to the ground into a "XX" Gruend-



**Gasoline locomotive and 8-ton carload of silica sand emerging from tunnel**



Open pit

ler swing hammer crusher, the product of which is returned to the car by a 14-ft. "OO" Gruendler continuous bucket elevator.

### Personnel and Management

Four brothers own and operate the Silica White Sand Co. A mutual agreement places each in charge of certain important work. Ivan T. Aubuchon is the manager; Edgar M., the shovel operator; Chas. C., the blacksmith and trouble-shooter, and Wm. M., the mine superintendent. Close personal supervision of all work is made possible by this arrangement, and conditions in all parts of the plant are known to the owners at all times. Problems regarding plant operations are decided upon at informal meetings of the four brothers.

All sales of silica sand are handled by the plant manager, who experiences little difficulty of disposing of the product. Purchasers of the silica sand include a number of large industrial organizations in the St. Louis district, chief among which is a nationally known foundry which uses the material in core making. The product mined by the Silica White Sand Co. is also used in the manufacture of glass, silica brick, glazed tile and plaster and also as a flux in metallurgical operations.

## Federal Census to Investigate Normal Working Week

For the first time the Census of Manufactures, to be taken early in 1930, will call for information on the practice of manufacturers with respect to the number of days that constitutes the normal working week of their plants, the Advisory Committee on the Census of Manufactures announces in discussing some of the more important aspects of that phase of the coming census. Specifically, the Advisory Committee points out inquiry will be made as to whether the workers in each plant are on a 6-day basis, 5½-day basis, or on a 5-day basis per week. During the past two or three years there has been much speculation on this subject but exact facts of a nation-wide scope have not been available.

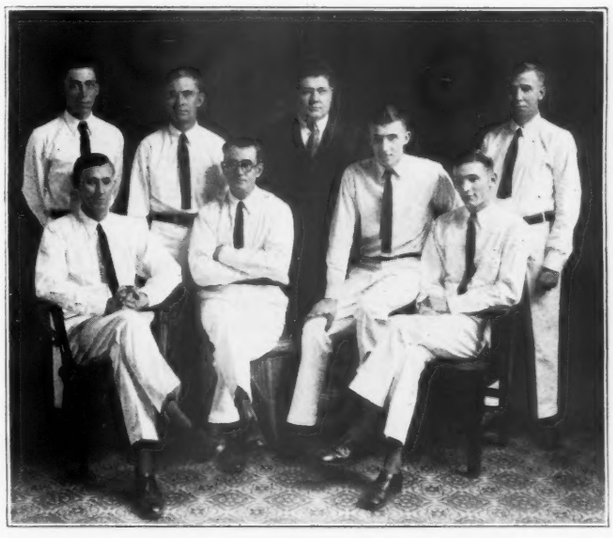
The Advisory Committee for the Census of Manufactures constitutes one of four groups of business men, economists, statistician and others named by Secretary of Commerce, R. P. Lamont, to cooperate with the Department in drawing up plans and schedules for the census. The other advisory Committees deal with distribution, unemployment, and population.

Emphasizing other important phases of Census of Manufacture the Committee says, migration of industry will be the subject of another inquiry that will be made for the first time. Movements of manufacturing which have been under way during the last decade have resulted in decreases in the requirements for skilled labor in one section of the country accompanied by increases in requirements for the same type of labor.

Manufacturers will be asked to give information on the number of shifts per day and the number of hours of labor per week, and the data on these matters will be more extensive that at any census since 1919. In addition there will be the usual questions on the number of wage earners and salaried persons, including monthly figures by which employed; the seasonal variations of employment in the several lines of manufacturing can be measured; and on the growing use of power and equipment.

## Some Men Who Appreciate Safety First

An account of the recent dedication of the Portland Cement Association's trophy that was awarded to the Quincy plant of the Wolverine Portland Cement Company appeared in the last issue of PIT AND QUARRY. Below we picture the first-aid team at this plant. Wonder what a first-aid team thinks about when it has no lost-time accidents to handle for a whole year!



**First aid team, Quincy plant, Wolverine Portland Cement Company. Left to right—Standing: Willard Smead, Robert Hickok, Claude Paul (instructor), Seth Shumay. Seated: Earl Duncan, Curtis Green (captain), Raymond Mann, Walter Brown**

# Federal Trade Commission Announces Its Action on Lime Industry's Rules of Practice

## Code Adopted by National Lime Association Modified Chiefly in Details

THE July, 17, 1929 issue of PIT AND QUARRY contained the Code of business practices that was considered and adopted, June 27, by the National Lime Association, then in session at the Mayflower Hotel, Washington, D. C. Commissioner William E. Humphrey of the Federal Trade Commission presided. He was assisted by H. Markham Flannery, Director of Trade Practice Conferences, and Stephen C. Van Fleet, Assistant Director. Approximately 70 per cent of the tonnage of the industry was represented.

The Conference was opened with an address by Director Flannery, in which he said: "Your gathering here this morning gives promise, or at least has the possibilities, of becoming the most important event in the relationship between the Government and your particular industry. I say important because it marks a new era in that relationship. Thus, in a trade practice conference proceeding, instead of assuming an antagonistic attitude, both the Government and the industry assume a cooperative attitude, an attitude wherein there is no room for accusations, distrust or suspicion, but an attitude wherein confidence is the predominant and outstanding feature. Therefore, in your work this morning and hereafter, in carrying out whatever resolutions you may adopt, you must have confidence—confidence in your competitors, confidence in the Commission, and confidence in the belief that only through mutual concessions, the giving and taking wherever that is deemed essential to the best interests of the greatest number, can this or any other industry ever hope to acquire competitive conditions which will be fair to all and profitable to each."

At the conclusion of the Conference, Commissioner Humphrey congratulated the industry, stating in part the following:

> "I congratulate you on the work you have done. I congratulate you on behalf of the public, that you have met and passed these resolutions and tried to clean up the industry, not only in your own behalf, but in behalf of the public generally.
>
> "Where industries meet in conferences of this kind and present resolutions to better conditions, and to clean their own house, it is not only a benefit to that industry, but gets the confidence of the public in the honesty and integrity of American Business, and the influence of this Conference goes far beyond the industry immediately represented."

W. V. Brumbaugh, of the National Lime Association, was unanimously chosen secretary of the conference.

The following text of the rules of business was prepared by Otis B. Johnson, secretary of the Federal Trade Commission:

Resolutions 2, 15, 17 and 19, as adopted, were stricken by the Commission. The "Note by the Industry," accompanying Resolution 7, as adopted, was also stricken. Resolution 16 and the accompanying note, as adopted, was stricken, and in lieu thereof the Commission substituted Rule 14 as appears herein. The note accompanying former Resolution 9, as adopted, reciting "An Act to Standardize Lime Barrels," is transferred to the close of this report, and appears as an exhibit hereto. Resolutions 23 and 24, creating and dealing with a committee of the industry, were not accepted by the Commission, being inappropriate as trade practice conference rules. The Commission, however, has no objections to the industry's having such a committee, and the resolutions appear as an exhibit to this statement. For these items refer to page 42, PIT AND QUARRY, July 17, 1929.

The remaining resolutions, after amendment in some instances, were accepted by the Commission and become the rules of business conduct on the subjects covered. Those appearing in Group I, having been held by the Commission to condemn unfair methods of competition, are affirmatively approved, and those appearing under Group II are accepted as expressions of the trade.

### Group I.

**Rule 1.** To discriminate in the prices charged to different customers of the same class for industry products; provided that this shall not prevent price discrimination necessarily resulting from differences in the grade, quality, or quantity of the commodity sold, or that makes only due allowance for necessary differences in the cost of selling or transportation, or discrimination in the same or different communities made in good faith to meet competition, is an unfair trade practice.

**Rule 2** (formerly Resolution 4). To secretly allow to purchasers of industry products—whether dealers or consumers—commissions, bonuses, rebates, refunds, credits, unearned dicounts, or subsidies of any kind, whether in the form of money, services, advertising, or otherwise, or to give premiums, or to extend to certain purchasers special terms, services, or privileges not extended to all purchasers under like terms and conditions, amounting to discrimination, is an unfair trade practice.

**Rule 3** (formerly Resolution 6). To wilfully interfere with any existing contract between any other manufacturer and a wholesaler, retailer, consumer, or other party, involving or relating to the sale of industry products, such interference being for the purpose or with the effect of dissipating, destroying or appropriating, in whole or in part, the business represented by such contract, is an unfair trade practice.

**Rule 4** (formerly Resolution 7). To sell industry products below cost for the purpose of injuring a competitor and/or lessening competition, is an unfair trade practice.

**Rule 5** (formerly Resolution 8). To defame or disparage a competitor, directly or indirectly, by words or acts which untruthfully call in question his business integrity, his ability to perform his contracts, his credit standing, or the quality of his product, is an unfair trade practice.

**Rule 6** (formerly Resolution 9). To violate the provisions of the Act of Congress approved August 23, 1916, Pub. No. 228, 64th Congress, entitled "An Act to Standardize Lime Barrels" in all transactions, is an unfair trade practice. (See U. S. Code, Vol. 44, Part I, of the U. S. Statutes at Large, Title 15, Chap. 6, sections 237-242, inclusive.)

(*Note:* The statute referred to in Rule 6 above is reproduced as an exhibit hereto.)

**Rule 7** (formerly Resolution 10). To sell lime or permit it to be sold in used barrels bearing the brand, label or name of a producer or dealer other than the one producing or selling the product contained therein, where the purpose or effect may be to mislead or deceive the purchaser as to the source of production, grade, quality or quantity of such product, is an unfair trade practice.

**Rule 8** (formerly Resolution 11). To sell or offer for sale any industry product for the purpose of or with the effect of deceiving customers or prospective customers as to the quantity, quality, or grade of such product, is an unfair trade practice.

**Rule 9** (formerly Resolution 12). To imitate or to simulate the trade mark, trade name, package, brand or label of a competitor in such degree as to deceive or have a tendency to deceive customers, is an unfair trade practice.

**Rule 10** (formerly Resolution 13). Marking, branding and labeling products and making statements regarding products, the purpose or effect of which may mislead or deceive purchasers as to the quantity, quality, grade, or substance of the goods purchased, is an unfair trade practice.

**Rule 11** (formerly Resolution 5). To secretly give or permit to be given to the agents, employees or representatives of customers, or the agents, employees or representatives of competitors' customers or prospective customers, money or anything of value as inducement to cause their employers or principals to purchase or contract to purchase industry products, or to influence such employers or principals to refrain from dealing or contracting to deal with competitors, is an unfair trade practice.

## Group II.

**Rule 12** (formerly Resolution 3). To put into effect changes in the established marketing customs and usages of the industry calculated to impair confidence or destroy stability in the industry without such reasonable notice as will enable the industry to meet such innovations on a basis of fair and open competition, is condemned by the industry.

**Rule 13** (formerly Resolution 14). To deviate from the established practices of the industry as regards the grade, quality or substance of standard industry products, or the size of packages or containers for such standard products, is condemned by the industry.

**Rule 14** (substitute in lieu of Resolution 16). It is the judgment of this industry that an accurate knowledge of costs is indispensable to intelligent and fair competition, and the general adoption of accurate and uniform methods of cost finding and estimating is strongly recommended.

**Rule 15** (formerly Resolution 18). To ship lime or lime products on consignment is condemned by the industry.

**Rule 16** (formerly Resolution 20). *Resolved*: That lime manufacturers who sell their products through brokers, jobbers and distributors, wholly or in part, shall use their best effort to bring about the observance of these rules of approved practice by such brokers, jobbers and distributors.

**Rule 17** (formerly Resolution 21). A jobber or distributor shall be defined as any person, firm or corporation who is engaged in the business of selling lime or lime products, either exclusively or with other materials, but is not engaged in the manufacture of the particular type or class of lime or lime products, and who sells the materials to another person, or to another firm or corporation in which he is not financially interested, for the purpose of resale, and who carries the account and is responsible for the credit risk of the shipment.

**Rule 18** (formerly Resolution 22). The Trade Relations Committee of the National Lime Association is hereby constituted the source within the industry from which manufacturers may secure information relating to the Trade Practice Conference and all rules adopted thereby.

*NOTE BY COMMISSION:* This does not preclude any member of the industry from addressing the Commission directly with reference to the violation of any rule.

## Exhibits

Rule 6, Group I, Act to Standardize Lime Barrels—8 chelt

Said act provides: "There is established a large and a small barrel of lime, the large barrel to consist of two hundred and eighty pounds and the small barrel to consist of one hundred and eighty pounds, net weight.

"It shall be unlawful for any person to sell or offer for sale lime imported in barrels from a foreign country, or to sell or offer for sale lime in barrels for shipment from any State or Territory or the District of Columbia, to any other State or Territory or the District of Columbia, unless there shall be stenciled or otherwise clearly marked on one or both heads of the small barrel the figures '180 lb. net,' and on the large barrel the figures '280 lb. net,' before the importation or shipment, and on either barrel, in addition, the name of the manufacturer of the lime and where manufactured, and, if imported, the name of the country from which it is imported.

"When lime is sold in interstate or foreign commerce in containers of less capacity than the standard small barrel, it shall be sold in fractional parts of said standard small barrel, and the net weight of lime contained in such container shall, by stencil or otherwise, be clearly marked thereon, together with the name of the manufacturer thereof, and the name of the brand, if any, under which it is sold, and, if imported, the name of the country from which it is imported.

"Rules and regulations for the enforcement of sections 237 to 242 inclusive, not inconsistent with the provisions of said sections, shall be made by the Director of the Bureau of Standards and approved by the Secretary of Commerce and such rules and regulations shall include reasonable variations or tolerances which may be allowed.

"It shall be unlawful to pack, sell or offer for sale, for shipment from any State or Territory or the District of Columbia to any other State or Territory or the District of Columbia, any barrels or other containers of lime which are not marked as provided in sections 238 and 239, or to sell, charge for, or purport to deliver from any State or Territory or the District of Columbia, to any other State or Territory or the District of Columbia, as a large or small barrel or a fractional part of said small barrel of lime, any less weight of lime than is established by the provisions of sections 237 to 242, inclusive, and any person guilty of a violation of the provisions of sections 237 to 242, inclusive, shall be deemed guilty of a misdemeanor and be liable to a fine not exceeding $100.

"It shall be the duty of each district attorney, to whom satisfactory evidence of any violation of sections 237 to 242, inclusive, is presented, to cause appropriate proceedings to be commenced and prosecuted in the United States court having jurisdiction of such offense."

**Resolution 23.** (Rejected). "RESOLVED, That this conference of the lime industry be continued as a permanent conference for the suppression of unfair trade practices and that the Trade Relations Committee of the National Lime Association investigate alleged violations of the resolutions and make complaints to the Federal Trade Commission, and, if deemed advisable, such Trade Relations Committee may request the Federal Trade Commission from time to time to call new conferences for the industry for the purpose of amending these resolutions.

"**Resolved Further**, That such committee be authorized to send its accredited representatives from time to time to the places of business of any or all manufacturers to make such investigations or inspections as may be necessary to determine whether the resolutions adopted by this conference are being observed in letter and in spirit."

The foregoing rule is not accepted by the Commission. The Commission has no objection to the industry's having such a committee, but in the

judgment of the Commission such resolution is inappropriate as a Trade Practice Conference rule.

**Resolution 24.** (Rejected). "The Trade Relations Committee of the National Lime Association is hereby authorized, on behalf of the industry, to approve or disapprove any changes or modifications made by the Federal Trade Commission in these resolutions adopted at the Trade Practice Conference on June 27, 1929."

The foregoing rule is not accepted by the Commission. The Commission has no objection to the industry having such a committee but, in the judgment of the Commission, such resolution is inappropriate as a Trade Practice Conference rule.

## The Official Registration List of Those Attending This Conference, and the Interests Represented

Abrahamson-Bode Corp., Los Angeles, Cal., Charles M. Cadman.
Allwood Lime Co., Manitowoc, Wis., M. E. Squire.
Aluminum Ore Co., East St. Louis, Ill., R. F. Rucker.
American Lime & Stone Co., Bellefonte, Pa., George L. Purnell, Samuel L. Shallcross.
Ash Grove Lime & Portland Cement Co., Kansas City, Mo., J. F. Pollack.
Austin White Lime Co., Austin, Texas, J. H. Chiles.
Baker Co., J. E., York, Pa., S. W. Stauffer.
Baker Stone Co., Bloomsburg, Pa., Frank Baker.
Barrick & Sons, S. W., Woodsboro, Md., L. C. Barrick.
Blair Limestone Co., Martinsburg, W. Va., R. C. Greenland.
Bluff City Lime & Stone Co., Ste. Genevieve, Mo., Joseph C. Aldous.
Brewer & Co., Inc., Worcester, Mass., K. M. Nahikian.
Bruns Hydrated Lime Co., The, Woodville, Ohio, C. F. Karnining, C. C. Robinson.
Chazy Marble Lime Co., Chazy, N. Y., Joseph R. Linney.
Cheney Lime Co., Birmingham, Ala., F. C. Cheney.
Corson, G. & W. H., Plymouth Meeting, Pa., Bolton L. Corson.
Cowell Lime & Cement Co., Henry, San Francisco, Cal., Chas. M. Cadman.
Dillon's Sons, Inc., E., Indian Rock, Va., L. P. Dillon.
Dittlinger Lime Co., New Braunfels, Tex., J. H. Chiles.
Eagle Rock Lime Co., Eagle Rock, Va., James H. McNamara.
Farnham Cheshire Lime Co., New York, C. J. Curtin.
Finishing Lime Association of Ohio, Toledo, Ohio, Calvert R. Smith.
Fonda Lime Kilns, St. Albans, Vt., George B. Wood.
Gager Lime Manufacturing Co., Chattanooga, Tenn., J. M. Gager.
Gibsonburg Lime Products Co., Gibsonburg, Ohio, Fred H. Rutschow.
Glencoe Lime & Cement Co., St. Louis, Mo., Gordon Willis.
Grove Lime Co., M. J., Lime Kiln, Md., J. H. Grove, Jr.
Groth, John F., & Son, Cedarburg, Wis., E. J. Groth.
Gully, F. O., Fayetteville, Ark., J. F. Pollock.
Haden Co., W. D., Houston, Tex., C. R. Haden.
Harris, Burton K., Saylesville, R. I., Burton K. Harris, William T. Cultron.
Hoosac Valley Lime Co., Inc., Adams, Mass., Donal O'Connor, George B. Wood.
Hoosier Lime Co., Salem, Ind., H. L. Vernia.
Hunkins-Willis Lime & Cement Co., St. Louis, Mo., Gordon Willis.
Indiana Limestone Co., Bedford, Ind., John G. Drummond.
Inland Lime & Stone Co., Manistique, Mich., G. J. Nicholson.
Kelley Island Lime & Transport Co., Cleveland, O., A. B. Mack.
Keystone Lime Works, Inc., Keystone, Ala., M. W. Hammond.
Kimbalton Lime Co., Inc., Shawsville, Va., S. C. Snead.
Knoxville Sand & Lime Co., Knoxville, Tenn., E. L. Osborn.
Ladd Lime & Stone Co., Cartersville, Ga., Norman G. Hough.
Lawrence Portland Cement Co., New York, N. Y., Cleason G. King.
Lee Lime Co., Lee, Mass., J. M. Deely.
LeGore Lime Co., LeGore, Md., C. C. Keeney.
Lehigh Portland Cement Co., Chicago, Ill., Norman G. Hough.
Limeton Lime Co., Front Royal, Va., R. E. Herr.
Limestone Products Co., Menominee, Mich., G. J. Nicholson.
Longview Lime Works, Longview, Ala., C. C. Cole.
Louisville Cement Co., Louisville, Ky., Eugene D. Hill.
Marble Cliff Quarries Co., The, Columbus, O., Russell Rarey.
Marblehead Lime Co., Chicago, Ill., W. J. Stewart.
Mayville White Lime Works, Mayville, Wis., Carl H. Ruedebusch.
Millard, H. E., Annville, Pa., Urban S. Blecher.
Miller Lime Products Corp., W. Stockbridge, Mass., Geo. B. Wood.
Mississippi Lime & Material Co., Alton, Ill., Harry B. Mathews, Jr.
Mohawk Limestone Products Co., Mohawk, N. Y., Scott Wulchet.
Moore Lime Co., Richmond, Va., Warner Moore.
Moores Lime Co., The, Springfield, O., Wm. H. Moores.
National Gypsum Co., Buffalo, N. Y., F. E. Davis.
National Lime Association, Washington, D. C., W. V. Brumbaugh, Norman G. Hough, Abram F. Myers.
National Lime & Stone Co., Findlay, O., Louis G. Love.
National Mortar & Supply Co., Pittsburgh, Pa., W. F. King.
New England Lime Co., Pittsfield, Mass., Bernard L. McNulty.
North American Cement Corp., New York, N. Y., Lawrence M. Eaton.
Ohio Hydrate & Supply Co., The, Woodville, O., Fred Witmer.
Ozark White Lime Co., Fayetteville, Ark., J. F. Pollock.
Peerless White Lime Co., St. Louis, Mo., Gordon Willis.
Pennsylvania Lime Products Co., Philadelphia, Pa., J. L. Durnell.
PIT AND QUARRY, Chicago, Ill., A. J. Hoskin, W. A. Buschman.
Powhatan Lime Co., Strasburg Junction, Va., A. P. Ferguson.
Riverton Lime Co., Inc., Riverton, Va., William E. Carson.
Rock Castle Cement & Lime Co., Baltimore, Md., R. S. Maslin.
Rockdale-Corson Lime Co., Strasburg Junction, Va., Phillip L. Corson.
Roche Harbor Lime & Cement Co., Roche Harbor, Wash., Charles M. Cadman.
Rockwell Lime Co., Chicago, Ill., Michael Brisch.
Rockland & Rockport Lime Corp., Rockland, Me., Donal O'Connor, George B. Wood.
Round Rock White Lime Co., Round Rock, Tex., J. H. Chiles.
Sheboygan Lime Works, Sheboygan, Wis., Miss Elfrieda H. Roth.
Southern States Lime Corp., Charleston, S. C., Gadsden Smith.
Standard Lime & Stone Co., Fond du Lac, Wis., W. A. Titus.
Stoner & Powell, Woodsboro, Md., J. E. Stone.
Steacy & Wilton Co., Wrightsville, Pa., R. P. Wilton.
Ste. Genevieve Lime Co., St. Louis, Mo., Gordon Willis.
Superior Lime & Hydrate Co., Pelham, Ala., H. G. Bridgewater.
Swanton Lime Works, The, Swanton, Vt., George B. Wood.
Utah Lime & Stone Co., Salt Lake City, U., W. L. Ellerbeck.
U. S. Lime Products Co., San Francisco, Cal., Charles M. Cadman.
Valders Lime & Stone Co., Valders, Wis., B. Brennan.
Vermarco Lime Co., West Rutland, Vt., Charles L. Montgomery.
Wait Lime Company, F. W., Glens Falls, N. Y., H. J. Russell.
Warner Company, Philadelphia, Pa., Charles Warner, Reed C. Bye, W. R. Hazzard.
Washington Brick, Lime & Sewer Pipe Co., Spokane, Wash., Charles M. Cadman.
Washington Building Lime Co., Baltimore, Md., J. K. Barbour.
Western Lime & Cement Co., Milwaukee, Wis., B. B. Williams, R. C. Brown.
Whiterock Quarries, Bellefonte, Pa., Ray C. Noll.
Williams Lime Manufacturing Co., Knoxville, Tenn., Harold Williams.
Wisconsin Lime Manufacturers Association, Chicago, Ill., James Fryer.
Woodville Lime Products Co., Toledo, O., G. H. Faist.
York Valley Lime & Stone Co., York, Pa., F. W. Cramer.

# Improvised Crushing Plant Works Deposit and Supplies Considerable Demand

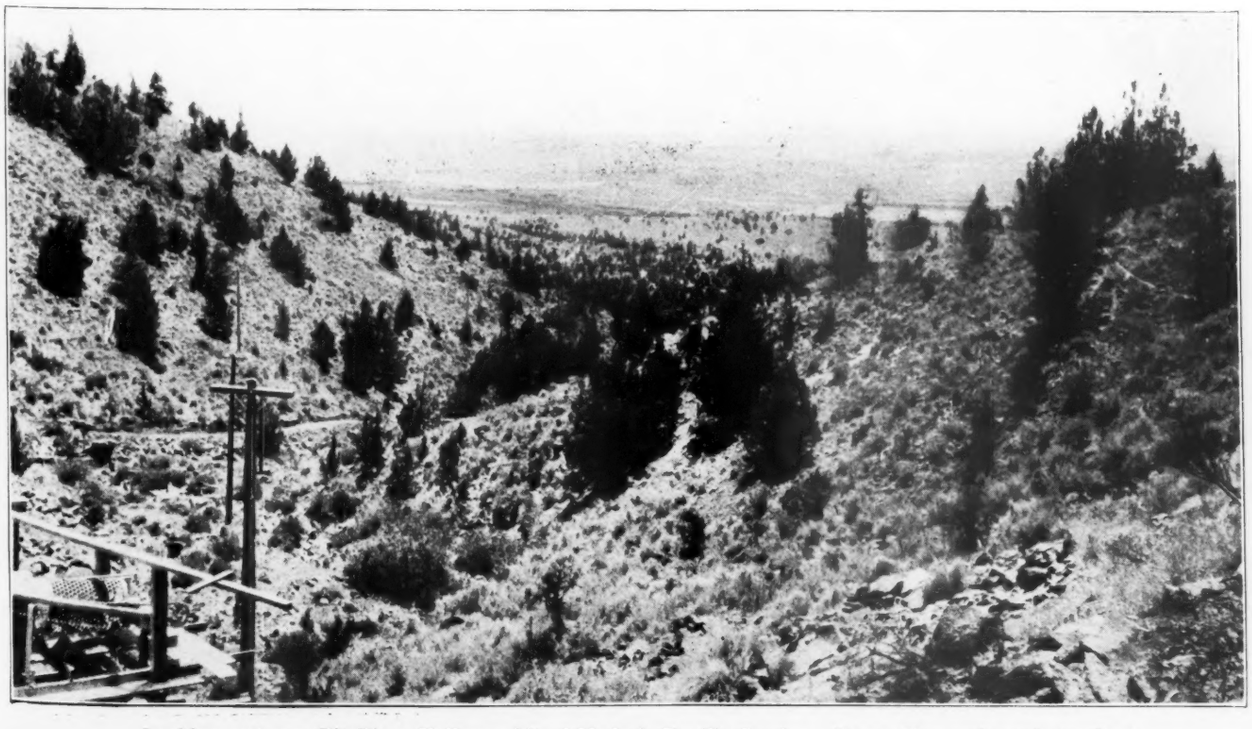
By ERNEST MOYER

ALTURAS, county seat of California's northeast county, Modoc, is, or rather has been, one of the typical frontier cattle towns of the west. But recently the Southern Pacific R. R. Co. built a new road from Klamath Falls, Oregon, south, joining the old local road at Alturas, thus making this point a junction, which, in addition to the erecting by the Pickering Company's saw mill of large capacity, and also being on one of the main east and west highways, the "Yellowstone cut off," has brought to this place quite an influx of business and prosperity. The old-style frame buildings, board sidewalks, and unpaved streets are indeed in marked contrast to the new up-to-date reinforced concrete and brick buildings that are rapidly being erected.

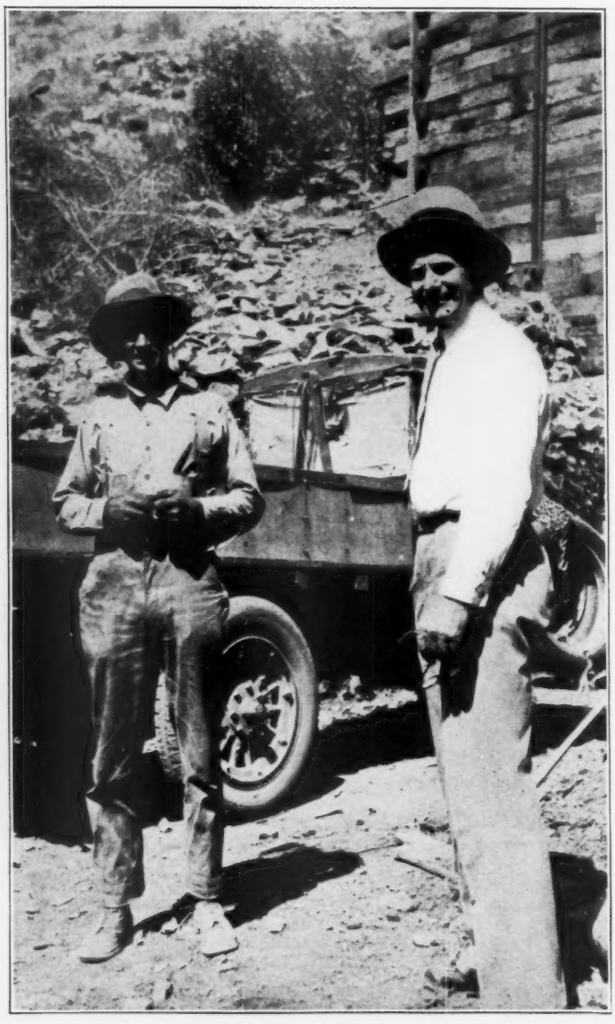
The country is generally sandy, gravelly and rocky, but principally of a soft lava formation unsuitable for concrete and road material. Sensing this and on the lookout for a business on which to center their activities, L. G. Renshaw and A. A. Ratchford, both local business men, prospected around (by the way, they are enthusiastic mule-tail deer hunters) and located an immense deposit, or rather slide of a basaltic type rock of excellent quality, dark gray in color, and consisting entirely of loose boulders, there being no ledges, or dirt, in the several hundred thousand yards so far tested. And it truly "lays on edge," the slope averaging about 27 deg.

Cable anchorage

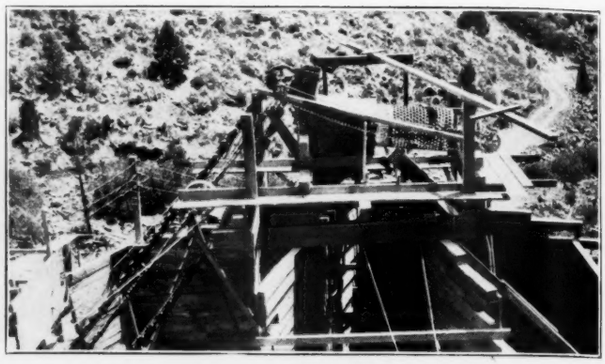
The quarry is 5½ miles from Alturas, 4 miles being state highway and the remaining 1½, private road built by the partners up a small canyon, the road ending at the quarry. The writer can clearly remember, years ago, when making and shipping basalt rock paving blocks from the counties around the Bay to San Francisco was a very flourishing business, that keen indeed, was the "prospecting" for a rock that would break free and true under the hammer, but never did he see any that would break down with as few blows as does this in the Renshaw and Ratchford Quarry.



Looking out over Pit River Valley, a bit of Modoc's Devil's Garden. Power line and road to plant



Left, A. A. Ratchford; right, L. G. Renshaw



Elevator, screens and 3-compartment bunker. Road to quarry at right

Very little material is lost in chipping, just about enough to level up the quarry floor. The business is being started as simply as possible and for a time rock will be hauled to crusher in wheelbarrows loaded by hand. It is interesting to note that while working within a short distance of the crusher 4 men with 2 wheelbarrows handling rock in convenient sizes to lift, and by not shoveling any small material, can keep the 10-in. by 20-in. jaw crusher continuously supplied. Undoubtedly in the near future, an air unit will be installed, and the boulders "blockholed" with jack hammers. In general shape the boulders run much wider and longer than they are thick and by drilling into the edges and blasting into thin slabs they can then be broken down to handling size with very little hammer work.

## Crusher, Elevator and Screen

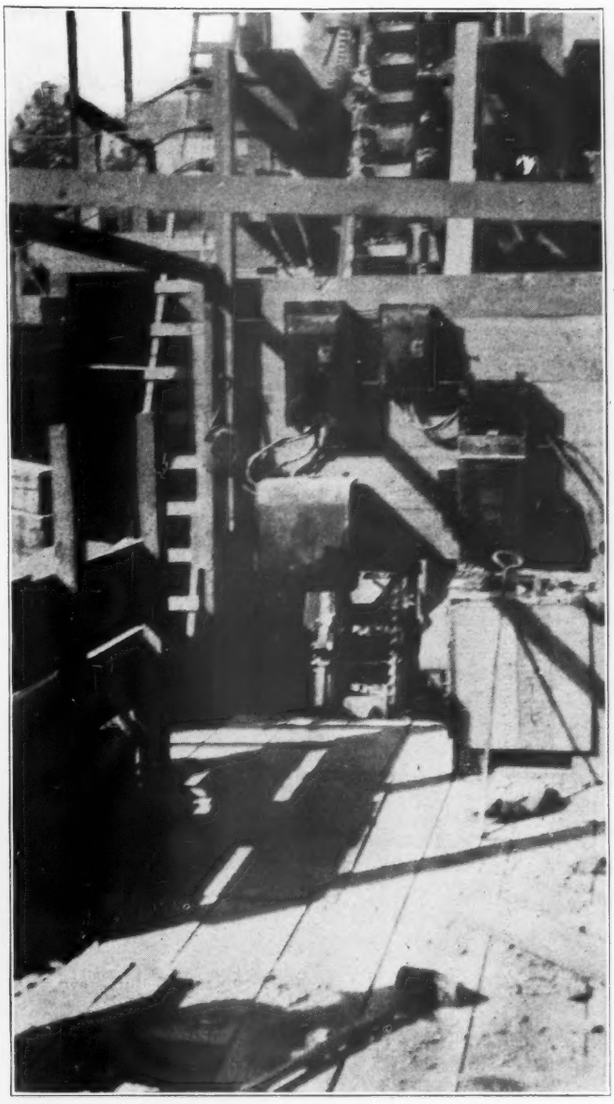
After prospecting and acquiring the quarry, Renshaw and Ratchford prospected some more and lo-

Quarry, crushing equipment, bins and driveway. Transformer near pole at left

cated a portable crushing outfit, unused for several years, and purchased same for a very nominal sum. The jaw-crusher is a 10-in. by 20-in., the movable jaw, lever and roller actuated; elevator, 33-ft. centers, pipe frame work, 11-in. buckets on double strand chain. The elevator stands at 58 deg., this unusual angle to insure the 11-in. buckets loading to capacity. The screen is of the shaft and spider type, 32-in. diameter by 8½ ft.

The entire installation was made as rapidly and as simply as possible, the requirements being that there should be some storage, and that all this used equipment should be employed to best advantage. So a space was leveled off for the crusher several feet higher than the lower edge of the quarry. This put the crusher discharge on the uphill side, but placed the crusher in the best position in which to wheel and dump rock. Pit for the elevator tail end was excavated at the up hill end of crusher and the elevator is installed at right angles to the crusher.

**Showing character of the boulders**

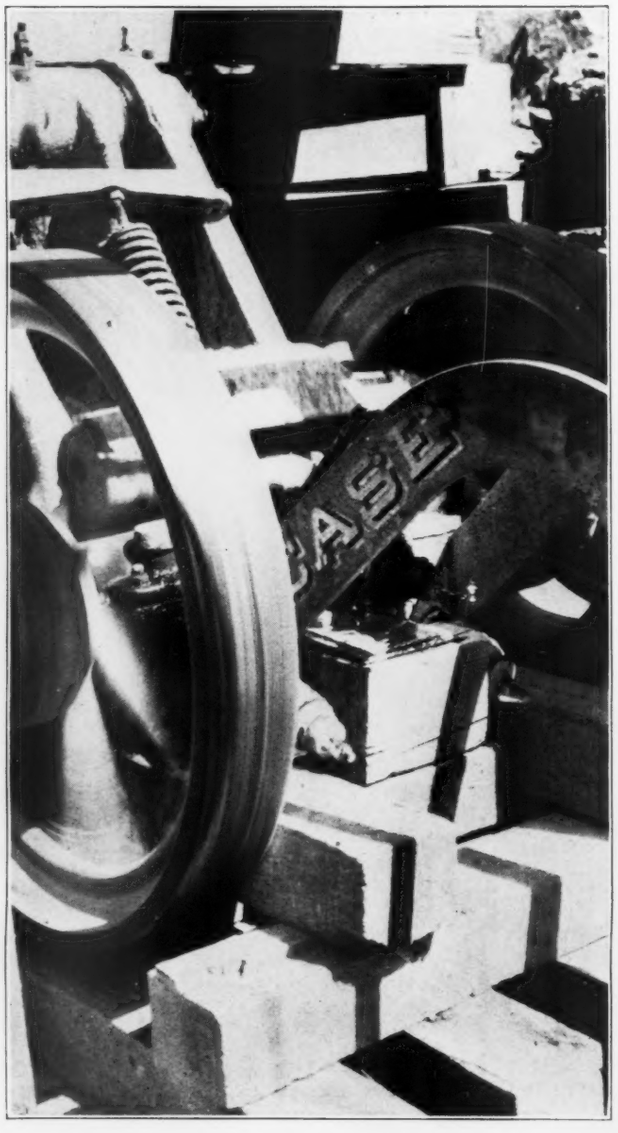


**Crusher platform. Electric equipment**

If future business justifies the outlay, the installation will be re-arranged, and a reduction crusher, at least, added. This crusher being a portable outfit, the wheels were removed, and the crusher was clamped down to a mat made of railroad ties, same resting on ground. Another mat of ties is in the bottom of the elevator pit and supports weight of the elevator. A word about the timbering. Recently, when the old narrow gage railroad through Alturas was broad gaged, much of the material of the narrow gage was offered for sale, ties and rails included. So whenever possible at all, 6 by 8 and 8 by 8 ties were used for timbering, these costing but a fraction of lumber prices.

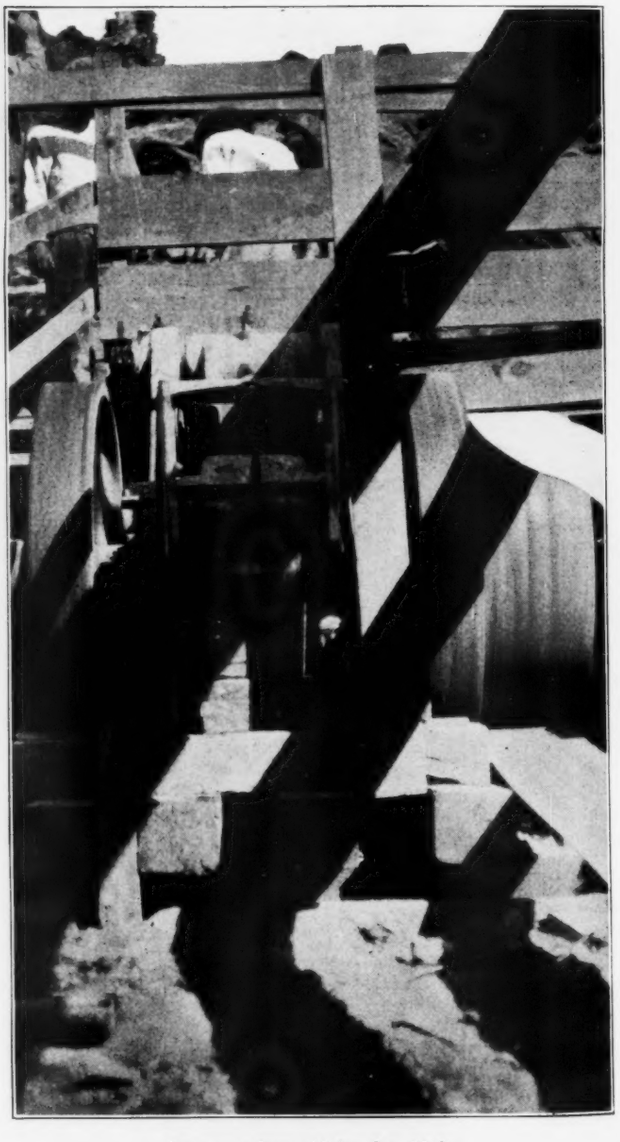
## Bunker

West of the crusher and paralleling it, and directly under the center of screen, was a shallow ditch filled with loose rock. Mud sills were laid on spaces leveled on top edge of this ditch and 16 ft. joists, ends resting on sills, were laid across and on



Close-up of crusher

these 8 by 8 ties were laid, forming bunker floor. Front of bunker is built of 6 by 8 ties on edge, joints broken, and both ends extending far enough so no sawing or fitting was done. Rails, two 30 ft. and two 20 ft., 40 lb., standing vertically against the bunker front are substantially anchored to hill by cables. Keep in mind that hill back of bunker front stands at 37 deg. Trenches were dug in this, paralleling bunker front, in which short 40 lb. rails were buried. Used cables of $\frac{5}{8}$-in. diameter were passed around vertical rails, back through bunker, and around anchor rails, were pulled tight and clamped. Two partition walls were built of ties, same as bunker front, forming a "V" point at bunker front wall. Thus storage for 3 sizes of material was provided, ends and back of bunker are the hill, and the 3 gates to load trucks are at one point, necessitating only the one driveway. While one crew was erecting the bunker, another was deepening and widening ditch, up to and under bunker for this driveway. The three bunker gates are in one unit attached to bunker floor, and sliding parallel to driveway. Three banked levers close to side of driveway and top ends hinged to bunker front wall, operate the gates through an arrangement of pull rods and cross arms. Screen timbering is supported by the two partition walls, and the screen, chain driven from elevator head shaft, classifies 3 sizes—$\frac{1}{4}$ in. to dust through jacket 1 in. by $\frac{1}{4}$ in. off of jacket, and 1 in. plus off the $4\frac{1}{2}$ ft. main section, $1\frac{1}{8}$-in. perforations. Elevator and screen are driven by 10 hp. 1200 r.p.m. motor, mounted on crusher platform, belt driving elevator counter-shaft, same in turn driving through sprocket and steel bushed roller chain, the elevator head shaft. The crusher is driven through 12-in. by 5-ply belt by 40 hp. 870 r.p.m. motor. Main line fused switches are ahead of the controllers. Motor controllers and the switches are mounted on wall at elevator end of crusher platform, all within easy reach of crusher feeder.



Jaw crusher, 10-in. by 20-in.

# MEN OF THE INDUSTRY

**The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.**

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**E. R. Sullivan**
Vice-president, Peerless-Egyptian Cement Company
Detroit, Michigan

## Coming Events

**Nov. 12-15, 1929. San Antonio, Tex.** Annual meeting, American Association of State Highway Officials.

**Nov. 13-15, 1929. Chicago.** Annual convention, International Acetylene Association, at the Congress Hotel. A. Cressy Morrison, secretary, 30 E. 42nd St., New York, N. Y.

**Nov. 20-23, 1929. Fort Worth, Tex.** Annual convention, International City Managers' Association.

**Dec. 2-7, 1929. New York, N. Y.** National Exposition of Power and Mechanical Engineering at the Grand Central Palace. International Exposition Company, New York, N. Y. Mr. Roth, secretary.

**Dec. 4-6, 1929. Chicago.** Annual meeting, National Paving Brick Manufacturers' Association, at the Palmer House. W. C. Schlesinger, secretary, National Press Bldg., Washington, D. C.

**Jan. 11-18, 1930. Atlantic City, N. J.** Annual convention and show, American Road Builders' Association. E. A. Birchland, secretary, 37 W. 39th St., New York, N. Y.

**Jan. 20-23, 1930. Cincinnati, O.** Annual convention and Manufacturers' Division Exposition, National Crushed-Stone Association, at Hotel Gibson. J. R. Boyd, secretary, Merchandise Bldg., 14th and S Sts., N. W., Washington, D. C.

**Jan. 28-30, 1930. Memphis, Tenn.** Annual convention and Manufacturers' Division Exposition, National Sand & Gravel Association, at the Peabody Hotel. V. P. Ahearn, executive secretary, Munsey Bldg., Washington, D. C.

**Feb. 11-13, 1930. New Orleans, La.** Annual meeting, American Concrete Institute, at the Roosevelt Hotel.

**Mar. 3-7, 1930. Chicago.** National Industrial Exposition at the Stevens Hotel. George Pfisterer, secretary, 308 W. Randolph St., Chicago.

**Apr. 5-9, 1930. New York, N. Y.; Hoboken, N. J.; Washington, D. C.** Fiftieth anniversary meeting, American Society of Mechanical Engineers, at American Machinist offices in New York; Stevens Institute, Hoboken; U. S. Chamber of Commerce Bldg., Washington.

**Dec. 2-4, 1929. Asheville, N. C.** Winter meeting, American Institute of Chemical Engineers.

**Dec. 10-31, 1929. Santiago, Chile.** International Railroad and Road Exposition. Secretary, San Martin 352, Santiago, Chile.

**Dec. 12-13, 1929. Washington, D. C.** Annual meeting, Highway Research Board, at the National Academy of Science and National Research Council.

**Jan. 29-30, 1930. Milwaukee, Wis.** Annual convention, Wisconsin Concrete Products Association, at Hotel Plankinton.

**April 7-11, 1930. Atlanta, Ga.** Annual meeting, American Chemical Society.

**June 16-25, 1930. Berlin, Germany.** World Power Conference. World Power Conference Program Committee, Room 818, 29 W. 39th St., New York, N. Y.

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## Low-Freezing Explosives Reduce Hazards in Industry

The art of producing low-freezing explosives has greatly increased the safety factor, according to Dr. Charles E. Munroe, chief explosives chemist, United States Bureau of Mines, Department of Commerce. Frozen dynamite is a most objectionable and dangerous substance, for the frozen sticks or cartridges tend to become rigid, Dr. Munroe points out. For loading into boreholes it is desired that the dynamite sticks shall be plastic so that they may be readily pressed into place. There is also the likelihood that rigid sticks may be ignited or exploded by friction against the walls if forced into a borehole. Frozen dynamite is difficult to detonate. Hence a grade of detonator which is quite capable of firing the unfrozen dynamite, and may be depended on to fire it, may not fire frozen dynamite at all, so that a misfire, with all its attendant evils, may result, or it may cause a partial explosion, or burning, giving off large quantities of poisonous fumes into a mine. Naturally such shots are not only a total loss, but, more than that, they are a source of additional expense and of danger. Consequently, users of dynamites have been strenuously warned against using frozen dynamite and advised to store their dynamite in such a manner as to prevent its becoming frozen, or if it became frozen, to thaw it before use.

In making dynamite, the nitroglycerine content is simply mixed with the other ingredients of the dynamite. In making explosive gelatin, some soluble cellulose nitrate is dissolved in the nitroglycerin. In neither case, does the nitroglycerin undergo any chemical change. It still retains all its properties, among which is its capacity to freeze at 56 deg. F. Hence the dynamites, explosive gelatins and gellatin dynamites will freeze by exposure to about 56 deg. F. because the nitroglycerin in them freezes, unless prevented by some special protection.

Since in the higher altitudes, and the higher latitudes of the temperate zones, where dynamites are most largely used, 56 deg. F. is not uncommonly reached during nearly one half the year, the freezing of dynamite was common and thawing was largely resorted to, but, because of many circumstances, it proved to be a most delicate operation and gave rise to many serious accidents. It is probable that in the many lists of accidents from explosives, published during the last 25 years of the last century, there was no one cause of accidents more frequently cited than that of attendant on thawing explosives and though the total number of casualties may have been less than those due to mine explosions, or explosions in transportation, because few persons were likely to be about where the thawing was done, yet the actual number was very large.

As has repeatedly been found true in the development of many inventions, all this time simple means for the prevention of dynamite freezing were right at hand. The principle was well understood and widely applied, even in domestic operations. And when the method was worked out and successfully applied to dynamites it was so obvious as to excite wonder it had not been applied years before.

The principle was made use of in freezing ice cream mixtures where a lower temperature than the freezing point of water was sought and this was obtained by dissolving common sea salt in water, preferably frozen water.

It is common knowledge that when sea salt is dissolved in water the temperature of the liquid falls below the freezing point of water and that a lower temperature is required to freeze this salt water than is required to freeze fresh water. A great variety of other inorganic salts, such as potassium carbonate, calcium chloride and others have been similarly observed to cause a fall in temperature as they dissolve in water, each to its own point, some of them, producing very low temperatures, and in each case the freezing point of the solution thus formed was proportionately low.

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## Lorenson-Matthews Company Doubles Size of Plant

Construction has started on an addition to the firm's new plant in Dickson City, Pa., which will double its present capacity. The firm offers a highly specialized and experienced service in the design and manufacture of any kind of equipment that can be fabricated from sheet metal and steel shapes. Such experience means a more accurate estimate of cost and delivery than would otherwise be possible—greater certainty that the finished job will be absolutely right.

# PERSONAL MENTION

**A. D. Brown** has been appointed district manager of the Buffalo, N. Y., office of the Allis-Chalmers Mfg. Co., to succeed **M. W. Phelps**, resigned. He was formerly associated with the Pittsburgh Transformer Co., and during the past year was special factory representative for the Pittsburgh Transformer division of the Allis-Chalmers Mfg. Co. He assumed his new duties on Nov. 1.

**A. R. Ellis** was recently elected vice-president in charge of operations of the Pittsburgh Testing Laboratories. Mr. Ellis has been general manager and director since 1921 and has been associated with the firm since 1910.

**L. M. Law**, asphalt technologist of the Shell Petroleum Corporation, St. Louis, Mo., was recently elected president of The Asphalt Association.

**L. E. Murphy** was recently elected president of E. F. Houghton and Company, Philadelphia. G. W. Pressell was elected second vice-president and secretary.

**M. T. Lothrop** was recently elected president of the Timken Roller Bearing Company, Canton, O. He became associated with the company in 1911 as a metallurgist and has since served in various other capacities. For the past few years he has been vice-president and general manager in charge of all operations and sales.

**B. A. MacDonald**, for 11 years sales manager for the Northwestern States Portland Cement Company at Mason City, Iowa, has been appointed assistant to the president taking the place left vacant by the death of **R. E. Boyle.**

**J. B. Cobanis**, for a number of years western sales manager for the Atlas Portland Cement Company and lately sales manager for a group of British Cement firms, has taken the place of Mr. MacDonald as sales manager.

**George M. Bechtel**, recently of the Los Angeles office of the Combustion Engineering Corporation, has been appointed branch manager of the new district office recently opened by that company at 1411 Fourth Ave., Seattle, Wash.

**J. R. Bakstad**, who designed a well-known crusher, has joined the Jeffrey organization as manager of the sales, crusher and pulverizer division. **G. P. Puhl**, who was on the Bakstad sales staff, will handle the sales of the Jeffrey Bakstad units.

**Robert S. Donaldson** recently addressed the Seattle Mining Club upon the talc deposits in Washington and their possible development.

**B. F. Jakobsen**, of Los Angeles, Cal., has evolved a method of determining stresses in masses of concrete of considerable size. He has won high honors, on two occasions, from the American Society of Civil Engineers for his researches in dam construction.

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**Frank Henderson**, manager of the Cleveland office of Combustion Engineering Corporation, died suddenly September 25, in his fifty-third year. He was born at Tuscola, Ill., Feb. 11, 1876, and joined the Green Engineering Company in 1898. He worked his way up in that organization as service man, tester and superintendent of service work. In 1922 when the Green Engineering Company was absorbed by Combustion Engineering Corporation, Mr. Henderson, who was then managing the Cleveland office, became the district manager for Combustion Engineering Corporation in which position he continued until his death.

**John W. Brooks**, aged 68, a foreman of the Western Indiana Gravel Company, died recently at Lafayette, Ind. He leaves his widow, five sons, a daughter and a brother.

**William H. Barnard**, 68, pioneer and leader in the American salt industry, died October 5 at his home in New York City. He was a director of the Avery Rock Salt Company, treasurer of the Detroit Rock Salt Company, treasurer of the International Salt Company.

**Ernest F. Harder**, aged 71, assistant to vice-president of the Westinghouse Company, and for 40 years prominently identified with the electrical manufacturing industry, died at his home at 80 Kenwood Place, East Orange, N. J., on October 13, 1929. His death was due to pneumonia.

Mr. Harder was born at Swamscott, Rostock, Germany, on August 15, 1858. He came to the United States when he was 25 years old and secured employment of George Westinghouse as a foreman at the Garrison Alley Works of the Westinghouse Company at Pittsburgh, Pa. This was at the time when Mr. Westinghouse was beginning his classic work with alternating current electricity. Mr. Harder was one of the first employes of the Westinghouse Electric and Manufacturing Company and remained with this organization all the rest of his life.

In 1893 he was sent to the Newark Works, where he won the position of foreman. In 1895 he returned to East Pittsburgh, being first advanced to general foreman and then four years later, made assistant superintendent. In 1904 he was transferred to the Newark Works at which time he was made superintendent, becoming works manager in 1918 and assistant to vice-president in 1926. Mr. Harder was a widower and is survived by two sons.

**Axel Henry Bergendahl**, manager of the New York district office of the Trumbell Electric Manufacturing Company died recently at Richmond, Va., of acute appendicities. He was on a business trip at the time of the attack and was operated on immediately. He survived the operation and was apparently recovering nicely when complications set in which ended fatally.

"Berg," as he was called by his many friends, was thirty-six years old and had been with the firm for eighteen years. He was appointed to the management of the New York district only a few months previously and was already making a record for himself in directing that important territory. He is survived by his wife and mother and a six-year old daughter.

**Arthur R. Wilson**, president and general manager of the Granite Rock Co., of Watsonville, Calif., and a member of the board of directors of the National Crushed Stone Association, died recently at his home in that city at the age of 63 years. He was making a visit to the company's quarry when he suffered a heart attack which resulted in his death.

He was born April 30, 1866, and graduated in 1890 from the Massachusetts Institute of Technology, where he studied civil engineering. He practiced this profession in Oakland after his graduation and from 1895 to 1897 was city engineer. On Jan. 23, 1900, he organized the Granite Rock Co., and has since devoted most of his time to its operation. He was also interested in numerous other business ventures and was a power in local and state politics. He leaves his widow, a daughter, and four sons.

# INSURANCE PROBLEMS DISCUSSED

## Partnership Insurance

In many ways a partnership is the best form of business organization, especially where the owners are also the active managers. It furnishes direct control. There is no "red tape." The partners can change their rules and plans at will without the formality of stockholders' meetings or votes of directors. And partnerships are cheaper, because many states collect annual fees from corporations, to say nothing of the burdensome Federal income tax on corporations.

There is only one draw-back to a partnership—the business stops on the death of any one partner.

Death stops the operations suddenly and absolutely regardless of the wishes of the survivors. If the surviving partner and the widow or son of the deceased want to continue the business, they can form a new partnership, but the law says the old firm must first close its doors and be liquidated. Even under the best conditions the closing and reorganization mean loss of considerable time and the loss of some customers.

It is not a simple matter, furthermore, for a business man to make an equitable deal with his former partner's widow. In many cases the survivor is either too grasping or conceited and forces a bad bargain on the widow which may virtually rob her of her capital. And in many other cases, the survivor cheats himself by being too sentimental toward his partner's family.

### Business Often Wrecked

I have personally seen several profitable businesses wrecked by the inability of a survivor and widow to make a fair agreement. In one, a capable son, who had been in partnership with his father, was expected by his sisters to carry the whole load of a business and support them with the profits. Giving the benefit of his brains and work to the sisters was unfair to his own wife and children; so he finally got discouraged and quit. In another instance, where all interested parties were sincere friends, it was impossible to arrange a deal because one family wished to base the new partnership relations on the book value, while the other wished to consider only the earning rate, which at the time was not in line with the book value. Such cases, where there is friendship and good will on all sides, of course are not as tragic as those where the survivor "squeezes" his partner's widow out of her rightful inheritance, and forces her to take a job for a living.

### Make Plan Ahead

The time to arrange for the future of a partnership is while all the members of the firm are living. If the problem is approached while everyone interested is enjoying normal health the judgment of each one will be clear and any agreement reached under such conditions will probably be fair to all parties. Since no one can tell which will die first, each partner will agree that terms should be arranged so that the family of the deceased will receive an adequate price for their share and the survivor will be free to manage the business. With such an agreement in advance death will not close up the operations.

Underlying any partnership contract of this sort are the following two ideals: (1) It is desirable for a widow to get her money away from the uncertainties of an active business and invest it in bonds, mortgages or other conservative securities, because the protection of principal is the first consideration. (2) The surviving partner should be given the sole ownership and management of the business, because he is presumably better fitted than anyone else to conduct it profitably.

### Sale of Partnership

To achieve these ideals the two partners (or more, if there are several) should go together to their lawyer and have him draw up a contract giving the terms on which the survivor is to buy out the share of a deceased colleague. The price for the deceased's interest may be computed from the book value at time of death, from the latest annual statement, or it may be fixed at an arbitrary amount, according to the wishes of the parties concerned. The second essential provision of the contract names the time limit within which the survivor must make his payment.

Granted that it is a fine public service to preserve the business of a partnership and to protect the owners against the loss of their capital, what has all that to do with insurance? Just this: Death comes unexpectedly, often prematurely; the surviving partner very likely would have trouble raising enough cash to pay off the widow, and anyway he should have his own funds free to put into the business.

The only practical plan for disposing of a partnership is for each partner to take out and pay for a life insurance policy on the other. If the agreed selling price is the appraisal or book value, then the insurance will constitute a first payment to the deceased's heirs and the survivor will be allowed one or two years to pay any balance due. A life insurance policy is so simple and definite, however, that a great many partnership contracts state that the amount of insurance shall be the entire sale price, and as the business increases in value, more insurance is added.

There are a few important technical problems in the case of each partnership which require individual advice. Whether the policies shall stand in the name of the deceased's estate, his family, or the surviving member of the firm; whether a bank or trust company shall be used as agent to handle the transaction for all parties on the death of a partner; what shall be done with the accumulated cash surrender value of the survivor's policy at the time of death—these questions cannot be answered in a general way. The laws of our forty-eight states vary a great deal and you must depend on the cooperation of a local attorney and insurance agent to work out a contract which is best suited to the laws of your own state and at the same time most economical in cost.

(The use of life insurance in protecting the business of a sole proprietorship will be the next article in this series.)

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## Certificate Required

The carriers in the southern and western territories are proposing to amend their tariffs containing subnormal rates on agricultural limestone and fluxing by publishing the following certificate which is also to be embodied in bills of lading to be signed by the shipper:

"In consideration of the reduced freight rate assessed by the carrier for transportation of this shipment, we hereby certify that this entire shipment consists of lime for agricultural or fluxing purposes having no commercial value as a chemical or building lime."

# FINANCIAL NEWS
## CORPORATE & BUSINESS

*The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of* PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

### Malagash Salt Co., Ltd.

At the annual meeting of this company held on October 21st, reports submitted showed that during the past year sales increased by 53 per cent over the previous year and that there had been a corresponding growth over the past three years. Outstanding securities of the company are $500,000 bonds, 6½ per cent, due 1947, and 10,000 shares of no-par common stock.

The following were elected as new directors: A. R. Chambers, Geo. W. MacKay, R. D. Graham, Frank Sutherland and Robert Murray.

At a meeting of the board subsequently held, Mr. Chambers was elected president; Geo. W. MacKay, vice-president; Jas. Gillespie, secretary, and Robert Murray, treasurer.

### Alpha Portland Cement Co.

In the last issue of PIT AND QUARRY we published an earnings report for this company for the twelve months ending June 30th. We have just received a report for the year ended September 30, 1929. The company's fiscal year ends December 31, so comparative items for the preceding twelve months are therefore lacking; however, we will compare a few of the outstanding items later.

**Twelve Months Ended September 30, 1929**

| | |
|---|---|
| Net sales | $12,373,664 |
| Operating expenses | 9,132,009 |
| Operating profit | $ 3,241,655 |
| Other income | 288,815 |
| Total income | $ 3,530,470 |
| Depreciation | 1,266,721 |
| Federal tax (estimated) | 274,404 |
| Net income | $ 1,989,345 |
| Preferred dividends | 140,000 |
| Common dividends | 2,133,000 |
| Deficit for period | $ 283,655 |
| Earned per share preferred (20,000 shares) | $99.25 |
| Earned per share common (711,000 shares) | 2.60 |

Sales for the 12 months given above are somewhat smaller than the sales of $13,400,000 for the 12 months ended June, and the net income of $1,989,000 is considerably smaller than the net income of $2,375,000 shown in the last published statement. As a result, per-share earnings are reduced on the common to $2.60 from $3.14 a share. It appears, then, that the third quarter of the current year was much less satisfactory than the third quarter of 1928. The cement business has, of course, been hampered by foreign competition, in the matter of price cutting particularly. It is possible that cement producers may get some relief from the tariff now being formulated by congress but that situation is so unstable that it would be unwise to make any kind of a prediction.

Alpha Portland Cement 7 per cent preferred is rather inactively quoted around 115 bid, while the common, after the last two had breaks in the market, is traded in on the New York Stock Exchange for about 29 to yield over 10 per cent on the basis of the $3 dividend. This dividend is not well assured in the light of smaller earnings but the company's treasury position is such as to permit payments if the management can see better results ahead.

Consolidated balance sheet of Alpha Portland Cement Co. as of September 30, 1929, compares as follows:

| | Sept. 30, '29 | Dec. 31, '28 |
|---|---|---|
| **Assets** | | |
| *Property account | $22,236,204 | $22,552,772 |
| Cash | 2,938,157 | 2,585,988 |
| Call loans | 2,600,000 | 2,800,000 |
| U. S. Government bonds | 1,357,975 | 1,357,975 |
| Working funds and advances | 155,754 | 186,744 |
| Accounts and notes receivable | 1,095,466 | 557,110 |
| Inventories | 2,485,053 | 2,848,269 |
| Miscellaneous investments | 220,967 | 212,166 |
| Deferred charges | 335,289 | 367,063 |
| Total | $33,424,865 | $33,468,087 |
| **Liabilities** | | |
| Preferred stock | $ 2,000,000 | $ 2,000,000 |
| †Common stock | 24,134,500 | 24,934,500 |
| Accounts payable | 391,203 | 447,723 |
| Wages payable | 84,952 | 46,955 |
| Federal tax reserve, etc. | 386,667 | 404,475 |
| Dividends payable | 533,250 | 533,250 |
| Insurance and other reserve | 822,513 | 727,716 |
| Earned surplus | 5,071,778 | 5,173,468 |
| Total | $33,424,865 | $33,468,087 |

* After depreciation, depletion, etc.

† Represented by 711,000 no-par shares.

### Ideal Cement Co.

In a letter accompanying the quarterly dividend of $1.75 on the common stock of this company, it was stated officially that the company's dividend policy has always been conservative and that, under existing conditions, there is no reason for the stockholders to anticipate any change in the present basis.

### CURRENT DIVIDENDS

| COMPANY | CLASS OF STOCK | DIVIDEND RATE | HOLDERS OF RECORD | PAYABLE |
|---|---|---|---|---|
| Alpha Portland Cement | Common | $.75 Qr. | Sept. 25 | Oct. 15 |
| Alpha Portland Cement | Preferred | 1¾% Qr. | Dec. 1 | Dec. 15 |
| Atlas Portland Cement | Common | $.50 Qr. | Nov. 16 | Dec. 3 |
| American Brick Co | Preferred | $.50 Qr. | Oct. 25 | Nov. 1 |
| Bessemer Limestone and Cement | Class A | $.75 Qr. | Oct. 20 | Nov. 1 |
| Bloomington Limestone Co | Common | $.07½ Qr. | ..... | Nov. 1 |
| Bloomington Limestone Co | Preferred | 1¾% Qr. | ..... | Nov. 1 |
| Calaveras Cement Co | 7% Pfd. | 1¾% Qr. | Sept. 30 | Oct. 15 |
| Canada Paving and Supply | 1st Pfd. | 1¾% Qr. | Nov. 15 | Dec. 1 |
| Cleveland Quarries | ..... | $.50 Qr. | Nov. 15 | Dec. 1 |
| Consolidated Sand and Gravel | Preferred | 1¾% Qr. | Oct. 31 | Nov. 15 |
| Construction Materials | Preferred | $.87½ Qr. | Oct. 19 | Nov. 1 |
| General Asphalt | Preferred | 1¼% Qr. | Nov .15 | Dec. 1 |
| General Refractories Co | Common | $.75 Qr. | Nov. 12 | Nov. 26 |
| Illinois Brick | ..... | $.60 Qr. | Oct. 1 | Oct. 15 |
| Indiana Limestone | Preferred | 1¾% Qr. | Nov. 20 | Dec. 1 |
| Johns Manville | Common | $.75 Qr. | Sept. 24 | Oct. 15 |
| Kentucky Cons. Stone Co | Preferred | 1¾% Qr. | Oct. 15 | Nov. 1 |
| Kentucky Rock Asphalt | Preferred | 1¾% Qr. | Nov. 15 | Dec. 3 |
| Lehigh Portland Cement | Common | $.62½ Qr. | Oct. 13 | Nov. 1 |
| Material Service Corp | ..... | $.50 Qr. | Nov. 15 | Dec. 1 |
| Metropolitan Paving Brick | Common | $.50 Qr. | Nov. 15 | Dec. 1 |
| Missouri Portland Cement | ..... | $.50 Qr. | Oct. 19 | Nov. 1 |
| Pacific Clay Products | ..... | $.60 Qr. | Oct. 20 | Nov. 1 |
| Pennsylvania Salt | Common | $1.25 Qr. | Sept. 30 | Oct. 15 |
| Pennsylvania Salt | Common | $1.00extra | Sept. 30 | Oct. 15 |
| Riverside Cement | 1st Pfd. | $1.50 Qr. | Oct. 15 | Nov. 1 |
| Riverside Cement | Class A | $.31¼ Qr. | Oct. 15 | Nov. 1 |
| Standard Paving Materials, Ltd | 7% Pfd. | 1¾% Qr. | Nov. 2 | Nov. 15 |
| Standard Paving Materials, Ltd | Common | $.50 Qr. | Nov. 2 | Nov. 15 |
| Superior Portland Cement | Class A | $.27½ M | Oct. 23 | Nov. 1 |
| Virginia Carolina Chemical | Pr'r Pfd | 1¾% Qr. | Nov. 17 | Dec. 1 |
| Warner Co | Common | $.50 | Sept. 30 | Oct. 15 |
| Warner Co | Common | $.50 extra | Sept. 30 | Oct. 15 |
| Worcester Salt Co | Preferred | 1½% Qr. | Nov. 10 | Nov. 15 |
| Wolverine Portland Cement | ..... | $.15 Qr. | Nov. 5 | Nov. 15 |

## Asbestos Corporation, Ltd.

An early statement which is expected to be given by President Massie of the corporation on the results of his survey of the operating situation is likely to bring some comfort to the shareholders. While admittedly saddled with deadwood in a few of the mines, which were taken over in the 1926 merger, several of the pits are understood to be making a strong come-back, and production is, according to reports, increasing steadily. It is understood that a growing volume of exceptionally high-grade rock is coming from the Vimy mine, much of which is pure crude, running up to three inches thick, which can be packed and shipped without going through the mill.

It is not believed that a reorganization will be necessary, the corporation being amply supplied with working capital to pursue the development plan which has been laid down by the new management.

According to the *Montreal Financial Times*, efficiency both at the mines and at the mills is having its effect upon earnings which should show a steady improvement from now on.

## Brazilian Portland Cement Co.

The *Montreal Daily Star* recently published an article in which the Canadian Foreign Investment Corp., Ltd., a holding company controlling the Brazilian Portland Cement Co., Ltd., and whose directorate is composed of a group of the leading Canadian financiers, stated, "Business of the Brazilian Co. has continued to be most satisfactory. They have been operating to the limit of their capacity and have always been in possession of orders for several months' output and feel that the use of their cement is now fully established."

## Calaveras Cement Co.

The Calaveras Cement Co., manufacturer of Calaveras cement, reported net income for the nine months ended September 30, 1929, as being $416,564 or $2.43 per share on the common stock. These figures are after all charges, including depletion and depreciation of approximately $97,500. Dividend requirements on the company's outstanding preferred stock were earned more than three and one-half times during that period. Current assets on September 30, 1929, were more than five times current liabilities. Cash on hand was shown as $577,788 and net working capital was in excess of $1,100,000. Regular dividends have been maintained on the preferred stock since the company's incorporation in 1925, but to date no disbursement has been made on the common.

The summarized report follows:

Nine months ended September 30, 1929—

| | |
|---|---|
| Net profit after all charges | $416,564 |
| Preferred dividends | 112,690 |
| Balance | $303,874 |
| Common shares outstanding (no par) | 125,078 |

Earned per share, preferred—$19.01.
Earned per share common—$2.43.

The *San Francisco Chronicle* stated that, according to officials of the company, unfilled orders now on the books indicate that operations for the final quarter of 1929 will be quite satisfactory.

## Cleveland Builders Supply and Brick Co.

Pursuant to proper corporate action all the land of this company has been conveyed to and is now held by the Cleveland Builders Realty Co., a new Ohio corporation, subject to a lease from the Realty Co. to the Builders Supply Co., and the Builders Supply Co. now holds in its treasury all of the capital stock of the Realty Co. The name of the Cleveland Builders Supply and Brick Co. has been changed to the Cleveland Builders Supply Co. and its authorized capital stock has been reduced from 240,000 shares to 80,000 shares. As a result of proper corporate action, holders of outstanding certificates of stock of Cleveland Builders Supply and Brick Co. are entitled to receive, in lieu of each share of stock, two-thirds of a share of capital stock of Cleveland Builders Realty Co., and one-third of a share of capital stock of the Cleveland Builders Supply Co.

Directors have ordered the holders of outstanding certificates of stock of Cleveland Builders Supply and Brick Co. to surrender the certificates, on or before November 1, 1929, to the Guardian Trust Co. of Cleveland, transfer agent, in exchange for the new stock to which they are entitled.

No certificates will be issued for any fractional shares of either company, but the stockholder will receive scrip representing fractional shares to which he is entitled. Scrip does not entitled the stockholder to receive dividends nor to vote, but the scrip in each company aggregating a whole share may be exchanged for a whole share. A syndicate has been formed which will buy or sell fractions of shares of Cleveland Builders Supply Co., on the basis of $60 a share and fractions of shares of Cleveland Builders Realty Co., on the basis of $24 a share.

This whole plan became official on October 19.

## Pass Borax Consolidated Dividend

A report from London states that Borax Consolidated, Ltd., passed its interim dividend on its £1,150,000 of £1 deferred ordinary shares for the first time in thirty-one years. The company has issued capital of £2,550,000 and £2,214,234 of bonds and debentures.

Competition of borax produced from brine from Searles Lake, California, has caused a fall in the price of borax. The company is now developing a new borate mineral at its own mine in California and removing its treatment plant to Los Angeles.

The new mineral is said to be the most economical yet discovered for conversion into borax and deposits are sufficient for an indefinite period.

## Duval Sulphur Split

Directors of Duval Texas Sulphur Co. have approved a plan whereby holders of present 100,000 outstanding capital shares will receive five new shares in exchange for each share now held.

The authorized capital is to be increased to 550,000 shares, of which 50,000 will be reserved for further expansion. A special meeting of the stockholders was called for October 31.

The company's property is located 65 miles inland from Corpus Christi, Tex., and plans are being made for erecting a plant which will double the present output of sulphur.

## Pennsylvania Salt Manufacturing Co.

At the annual meeting of the stockholders of the Pennsylvania Salt Manufacturing Co. the directors of the company were reelected.

Stockholders also approved an amendment to the by-laws giving the directors the power to increase the number on the board from nine to twelve.

Officers were subsequently reelected.

## Detroit Graphite Co.

It was reported by the *Wall Street Journal* that negotiations have been concluded regarding the merger of the Detroit Graphite Co. and Valentine and Co.

## Republic Portland Cement Co.

This company recently organized under the laws of Texas to engage in the manufacture and sale of Portland cement and, owning 475 acres of land lying approximately ten miles northeast of San Antonio, recently authorized an issue of $1,250,000 worth of first mortgage 6 per cent sinking-fund gold bonds, due September 1, 1943.

The financial statement just made public follows:

As of September 1, 1929

ASSETS

| | |
|---|---|
| Cash | $ 50,444.02 |
| Accounts receivable | 46,877.24 |
| Inventory of cement and clinker | 33,812.60 |
| Inventory of operating supplies | 108,185.23 |
| Total current assets | $ 239,319.09 |
| Land, including quarry | $ 584,000.000 |
| Buildings and plant | 1,069,351.60 |
| Machinery | 1,521,004.94 |
| Track service department | 209,726.20 |
| Employees' village | 99,533.25 |
| Furniture and equipment | 22,875.48 |
| Total fixed assets | $3,506,491.47 |
| Deferred —advertising | 8,977.22 |
| Total assets | $3,754,788.22 |

LIABILITIES

| | |
|---|---|
| Accounts payable | $ 5,357.03 |
| Total current liabilities | $ 5,357.03 |
| First mortgage bonds payable | 1,250,000.00 |
| Preferred stock (7% $100 par) | 1,250,000.00 |
| Common stock (no par) Authorized 250,000 shares Unissued 4,468 shares | |
| Outstanding 245,532 shares | 1,249,431.19 |
| Net worth | 2,499,431.19 |
| Total liabilities | $3,754,788.22 |

The bonds are, in the opinion of counsel, secured by a first mortgage on the plant buildings, equipment, mineral deposit, and lands of the company, having a value as a going concern, according to Richard K. Meade and Co., engineers, of Baltimore, Md., and Terrell Bartlett Engineers, Inc., of San Antonio, Tex., of $3,750,000.

Based on the actual cost of producing cement since the company began operation on August 20, 1929, the company has estimated that its net earnings for the first full year of operation, after operating expenses, local taxes, and depreciation, will be in excess of $600,000 or eight times the maximum annual interest requirement on the $1,250,000 of these bonds presently outstanding. The company has already shipped over 50,000 barrels of cement and has orders on hand sufficient to operate the plant for over three months.

The proceeds of this bond issue will be used to reimburse Smith Brothers, Inc., in part, for advances made in connection with the completion of the company's plant.

Payment of both the principal and interest has been unconditionally guaranteed by the endorsement of F. A. Smith and J. H. Smith whose net worth according to a statement dated February 25, 1929 is $4,992,946.09.

J. H. Smith, in his capacity as president of the company, will give his personal attention to the successful operation of the company. Mr. Smith has been actively engaged in road building and major construction, such as waterworks, pipe-lines, tunnel systems, and skyscrapers, for the past twenty years. During this period he has established many contacts with material men, road builders and other extensive users of cement which insure a wide distribution for the company's product.

W. M. Thornton, vice-president of the company, has had over twelve years' experience with the San Antonio Portland Cement Company and the International Cement Corporation and is well qualified to direct the manufacturing and sales policies of Republic Portland Cement Co.

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## Texas Gulf Sulphur

Earnings of this large sulphur producer for the first nine months of the current year are presented in the table below, in contrast with results for the corresponding period of last year. It is encouraging to note the excellent comparison the last quarter and the last nine months make with similar periods in preceding years. Demand for sulphur has been excellent this year and prices have been satisfactory, it now being around $19.50 a ton or moderately higher than last year.

Net income for the nine months ended September 30, totaled $11,280,389, after depreciation and federal taxes but before depletion equal to $4.52 a share; comparing with $10,355,381 or $4.08 a share in the first nine months of the perceding year.

During the last quarter the company increased its reserves for depreciation and accrued federal taxes by $567,194 making a total of these reserves $12,389,090 on September 30, 1929.

The statement for the quarter ended September 30, 1929, compares as follows:

| | 1929 | 1928 | 1927 | 1926 |
|---|---|---|---|---|
| *Net inc'e. | $4,028,959 | $3,681,723 | $2,936,189 | $2,531,468 |
| Dividends | 2,540,000 | 2,540 000 | 2 540,000 | 1,905,000 |
| Surplus. | $1,488,959 | $1,140,723 | $ 396,189 | $ 626,468 |

Nine months ended September 30:

| | 1929 | 1928 | 1927 | 1926 |
|---|---|---|---|---|
| *Net inc'e | $11,480,489 | $10,355,381 | $ 9,053,097 | $6,322,010 |
| Dividends | 7,620,000 | 7,620,000 | 7,620 000 | 5 080,000 |
| Surplus | $ 3,860,489 | $ 2,735,381 | $ 1,433,097 | $1,242,010 |
| †P. and L. Surplus. | $19,161,572 | $13,678,845 | $10,437,188 | $8,492.286 |

*After depreciation and federal taxes

†Includes reserves for depletion.

## Cement

Trunk Line Association Docket No. 21931 proposes rates in cents per 100 pounds on cement carloads as follows:

| | Rate |
|---|---|
| From Alsen, N. Y., To— | |
| Breaker Island, N. Y. | 8½c |
| Menands, N. Y. | 8½c |
| Cemetary, N. Y. | 8½c |
| Fair Grounds, N. Y. | 8½c |
| Watervliet Arsenal, N. Y. | 9c |
| Watervliet, N. Y. | 9c |
| Lansingburg Switch, N. Y. | 9c |
| From Binnewater, N. Y., To— | |
| Breaker Island, N. Y. | 9½c |
| Menands, N. Y. | 9½c |
| Cemetary, N. Y. | 9½c |
| Fair Grounds, N. Y. | 9½c |
| Watervliet Arsenal, N. Y. | 9½c |
| Watervliet, N. Y. | 9½c |
| Lansingburg Switch, N. Y. | 9½c |
| From Brixment, N. Y., To— | |
| Breaker Island, N. Y. | 16½c |
| Menands, N. Y. | 16½c |
| Cemetary, N. Y. | 16½c |
| Fair Grounds, N. Y. | 16½c |
| Watervliet Arsenal, N. Y. | 16½c |
| Watervliet, N. Y. | 16½c |
| Lansingburg, N. Y. | 16½c |
| From Buffalo, N. Y., To— | |
| Breaker Island, N. Y. | 17c |
| From Black Rock, N. Y., To— | |
| Menands, N. Y. | 17c |
| Cemetary, N. Y. | 17c |
| Fair Grounds, N. Y. | 17c |
| Watervliet Arsenal, N. Y. | 17c |
| Watervliet, N. Y. | 17c |
| Lansingburg, N. Y. | 17c |
| From Hudson, N. Y., To— | |
| Breaker Island, N. Y. | 8½c |
| Menands, N. Y. | 8½c |
| Cemetary, N. Y. | 8½c |
| Fair Grounds, N. Y. | 8½c |
| Watervliet Arsenal, N. Y. | 8½c |
| Watervliet, N. Y. | 8½c |
| Lansingburg, N. Y. | 8½c |

The proposed rates are said to be comparable with rates from Albany and Troy, N. Y.

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## Johns-Manville Heading for Peak Year

Johns-Manville Corporation is well on its way to establish new high records in both sales and earnings for the current year. We are given every indication to expect that net earnings will come close to $10 a share on the 750,000 common shares while sales should run in excess of $60,000,000. In 1928 on sales of $47,945,559 net income of $5,589,398, or $6.75 a common share, after preferred dividends was realized. While part of this year's excellent showing can be attributed to the inclusion of the business of Celite Co., Banner Rock Products Co., and Weaver-Henry Co., the major portion is due to the growing demand for the company's established lines.

The regular quarterly report for the three months period ended September 30, was published in the last issue of PIT AND QUARRY. This report was exceptionally good with sales showing an increase of 37.1 per cent and net profit showing an even better gain of 44.2 per cent higher than the like period of 1928.

During the past several years, Manville's earnings have been showing consistent improvement, the gains recently becoming more marked. The speed with which earning power is being built up is best visualized by pointing out that the net of $5,522,-

396 for the first nine months of 1929 was only $67,002, or slightly more than 1 per cent below earnings of $5,589,398 for the entire year of 1928, while they exceeded 1927's net of $4,108,159 by $1,414,237, or 34 per cent. Sales for the first three quarters of 1929 totaled $46,776,102, an increase of $11,900,870 or 34.1 per cent over the $34,875,232 period in the last year. Sales so far in 1929 are only $1,169,457 below the entire year of 1928 and exceed 1927 by $2,462,401.

Although the company is an important factor in the building materials field, its growing sales in other lines have more than compensated for any falling off in the demand from construction activity.

This year has been marked by a wide expansion in Manville's line of output. The exclusive right to manufacture in the United States and Canada transite seamless pipe, made of asbestos and portland cement, was secured some months ago. Previous to that, a contract was closed with the Florida Travertine Corporation, whereby Manville would be the exclusive agent for travertine, a building stone heretofore supplied mainly by Italian quarries. See PIT AND QUARRY, May 22, 1929, for description of the deposit.

Celite Company of California was acquired recently. This company has annual sales of around $4,000,000 and owns a deposit of diatomaceous earth.

Foreign business shows gains, and it is the company's policy to intensify its efforts along this line. Accordingly the Johns-Manville International Corporation was formed several months ago with a capitalization of $1,000,000 to act as a holding company for all foreign subsidiaries with the exception of Canada. A German subsidiary was recently formed and its entire capital stock is owned by the new corporation. Several companies are also owned either entirely or partially, in France, Belgium, England, Cuba and Brazil. It is the intention to develop as much as possible the manufacture of products in the country in which they are sold, employing native labor entirely.

The following table indicates the growth of the company during the past six years.

| | Sales | Net Profit | Net a Common Share | Number of Common Shares |
|---|---|---|---|---|
| 1928 | $47,945,559 | $5,589,398 | $6.75 | 750,000 |
| 1927 | 44,313,701 | 4,108,159 | 4.77 | 750,000 |
| 1926 | 45,042,326 | 4,856,033 | 19.42 | 250,000 |
| 1925 | 39,301,263 | 3,017,207 | 12.06 | 250,000 |
| 1924 | 37,627,084 | 2,339,003 | 9.35 | 250,000 |
| 1923 | 38,261,024 | 3,662,008 | 14.69 | 249,209 |

## New Corporations

Atlantic Lime Rock Corp., Sandersville, Ga.; $30,000. F. Pembroke Pope, W. S. Pretorius, D. E. Bird. To quarry lime rock.

Tri-State Sand & Gravel Corp., Angola, Ind.; $10,000. Fred E. Thomas, Cortland S. Willard. To produce sand, gravel and stone.

Toronto Ready Mix Concrete, Ltd., Toronto, Ont., Can.; $200,000.

Fort Dodge Limestone & Clay Products Co., Fort Dodge, Iowa; $100,000. J. H. Coughlin, Pres.; L. W. Smith, V. P. & Mgr.; C. D. Coughlin, Sec.-Treas.; E. Z. Conway, R. P. Doud.

Conestoga Stone & Lime Co., Harry C. Rote, Treas., Lancaster, Pa.; $10,000. John R. Bowermaster, 522 E. Chestnut St., Lancaster. To quarry stone and manufacture lime.

River Sand Supply Co., Ltd., Montreal, Que., Can.

Camden Gravel Co., Camden, Ark.; $20,000. Geo. K. Force, Andy R. Taylor.

Grand River Gravel Co., Ionia, Mich.; 500 shares n.p.v. S. F. Phillips, 105 W. Main St., Danville, Ill.; M. A. Neville, Lafayette, Ind.; R. R. Bookwalter, Danville, Ill. (owned by Western Indiana Gravel Co.).

Rockland Crushed Stone Co., Ltd., Montreal, Que., Can.; $49,000.

Concrete Products, Ltd., Regina, Sask., Can.; 500 shares pfd.; 35,000 shares com., n.p.v. C. S. Cameron, Pres.; N. M. Storey, Sec.-Treas.; J. E. Bennett, Man. Dir. Gravel and concrete plants at Saskatoon, Sask., and Calgary, Alta.

Moline Consumers Co., Moline, Ill.; $200,000. $14,000 to be used at La Grange, Mo., where gravel plant will be built with Fred Lohmeier as Supt.

Hudson River Quarries, Inc., care of Judson D. Campbell, attorney, 11 W. 42nd St., New York City; 100,000 shares com.

Standard Cement Products Co., Perry Rickśler, Treas., Palmyra, Pa.; $25,000. To quarry stone.

German American Cement Co., care of Walter Jeffreys Carlin, attorney, Mr. Witte, 2 Rector St., New York City. S. M. Schatzkin, 60 Broad St., New York City, interested. $1,000,000.

Staunton Lime Co., Inc., Staunton, Va.; $50,000. Robert L. James, Pres. To quarry limestone.

Indiana Stone Corp., Indianapolis, Ind.; 500 shares pfd., n.p.v.; 500 shares com., n.p.v. Frederick E. Schortemeier, Robert K. Eby, Joseph G. Wood.

Keyport Stone & Lime, Inc., Chas. W. McKee, Huntington, Ind.; $120,000; 2,800 shares n.p.v. To succeed Logansport Lime & Stone Co., Logansport, Ind.

Montvert Slate Co., Poultney, Vt.; $50,000.

Oak Hill Sand & Gravel Co., Needham, Mass.; $10,000. John Pearson, Pres.; Ralph A. Mention, Treas., Dorchester, Mass.; Perley W. Smith.

Chappus Gravel Co., Ltd., Windsor, Ont., Can.; $600,000. A. Chappus, Pres.; M. Chappus. Will develop deposits on Lake Huron.

National Gravel & Fuel, Ltd., Windsor, Ont., Can.; $100,000.

Wilson Sand & Gravel Corp., care of N. J. Corp. Guar. & Trust Co., Camden, N. J.; $50,000 pfd.; 1,000 shares com.

J. C. Steele Rock & Sand Co., 1013 W. Jefferson St., Phoenix, Ariz.; $40,000. John C. Steele, Warren H. Steele, Frank H. Sellner, R. C. Kaster.

## United States Gypsum Co.

The Chicago Stock Exchange has admitted to listing 380,184 additional shares of common stock ($20 par value) of the United States Gypsum Co., and trading in these shares was officially recognized on October 22nd.

## Southern Asbestos-Thermoid Merger

Approximately 90 per cent of the outstanding stock of the Southern Asbestos Company has been deposited under a plan for merger with the Thermoid Co., and the plan has been declared operative.

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**J. J. Kelleher** recently became associated with the contractor's division, explosives department of the Hercules Powder Company. Mr. Kelleher, well-known throughout the south-east as an experienced explosive man, leaves Tampa, Florida to make Wilmington, Delaware, Hercules' home office, his headquarters.

**J. R. St. Clair**, formerly of the sales force of the Hercules Powder Company's branch office in Duluth, Minn., will arrive in Wilmington, Del., Nov. 15, to join Hercules' explosives technical service staff.

**G. E. Gilley**, of Gilley Bros., Ltd., producers of sand, gravel and crushed stone, at New Westminster, B. C., has been in Chicago on business, accompanied by his son, **Capt. H. L. Gilley.**

# LEGAL INFORMATION FOR OPERATORS

## Important New Law Involving Injuries Under Workmen's Compensation Statutes

In accordance with the trend of modern protective procedure, almost all states have adopted laws requiring corporations and individuals to perform certain legal duties, such as submitting detailed reports to the state officials of the number of regular employees, the duties of such employees, and the salary earned by such employee. In many instances, the employers are required to contribute to a fund set aside for compulsory payment of compensation to injured employees.

Under the common law the employee is not entitled to damages for injuries, unless such injuries result from negligence in some degree on the part of the employer. However, the Workmen's Compensation Laws definitely specify the amount of compensation to which an injured employee is entitled, irrespective of the cause, providing the injury was sustained while the employee was acting within the scope of the employment.

### Must Abide by Compensation Laws

The Courts have consistently held that employers, who fail to comply with the Workmen's Compensation Laws, not only are subjected to payment of heavy penalties but, also, automatically become liable in damages for all injuries sustained by their employees, irrespective of the provisions of these laws which may reduce the common law liability.

For illustration, in Holton v. Clayco Co., 145 S. E. 637, decided during the past few weeks, an employee negligently injured himself. He sued his employer for damages and introduced testimony showing that the employer had failed to abide by the state compensation laws.

In view of this evidence, the Court held the employer liable notwithstanding the cause of the injury, and said:

"When an employer comes within the purview of the Workmen's Compensation Act and is not protected by it, and a suit is brought against him for an injury occurring to one of his workmen, received in the course of his employment and arising out of it, he (employer) cannot interpose, as a defense, assumption of risks, or negligence and carelessness on the part of the workman, where the employer has been negligent himself, and from which negligence the injury resulted."

Therefore, it is apparent that an employer who fails to conform with the state compensation laws materially increases his chances for financial losses resulting from injuries to employees.

Another important point of the established law is that an employer who fails to abide by the provisions of the state statutes, or clauses in an insurance policy, may lose his legal rights to avoid payment to the employee for the injuries, or collection from the insurance company of the damages which he was compelled to pay employee.

### Employee Not Entitled to Compensation

Conversely, it is true that an injured employee is bound to abide by the law, otherwise he cannot recover compensation. For instance, in Montello Co. v. Schultz, 222 N. W. 315, decided during the past few weeks, an employee, who was injured while performing his regular duties, failed to give his employer a *written* notice of the injury, as required by the compensation laws.

Although the counsel for the employee proved that the employer saw the accident causing the injury, the Court held the employee not entitled to compensation, saying:

"The Workmen's Compensation Act is statutory in its origin, and whatever rights employees have, in regard to compensation, accrue solely by virtue and under the provisions of the statute. . . . As a part of this statutory scheme the employee is required to give notice of his disability. The period of such notice is limited in order to enable the employer to determine whether the claim is a bona fide one, and to afford him an opportunity to examine into the facts concerning the injury, and the extent of such injury, and all other necessary facts involved in a compensation claim."

### Within Scope of Employment

Generally speaking, an employee is not entitled to compensation under the Workmen's Compensation Laws, unless the injury arises from and is incidental to the particular work which the employee is hired to perform.

For instance, in Lev v. Krug Co., 225 N. W. 559, it was disclosed that an employee was hired *to manage* a gravel pit. He was sent by his employer to a cement factory. The vehicle in which he was to ride was selected for him by his employer. He was required to ride on this truck, and while thus riding a fowl of some kind flew against the windshield. The impact was sufficient to shatter the glass, a piece of which injured the employee's left eye.

The employee sued to recover compensation, but the Court held that the accident did not arise from the employment and, therefore, the employee was denied compensation. This Court said:

"The causative danger must be peculiar to the work . . . It must be incidental to the character of the business, and not independent of the relation of master and servant. It need not have been foreseen or expected, but after the event it must appear to have had its *origin in a risk connected with the employment*. . . . Unless the proof justifies us in concluding that this particular risk or danger which resulted in plaintiff's injury was one which was peculiarly incident to his work as the caretaker and watchman of a gravel pit, it cannot be said that the accident arose out of his employment. Surely it cannot be said that the probability of the plaintiff being injured by a fowl flying into the windshield of a motor vehicle in which he was riding was any greater because of the fact of his particular employment as a watchman or caretaker than would have been the risk or probability of injury to any other traveler in an automobile in the same locality."

In many instances, persons confuse the terms "within the scope of the employment" and "in the service of the employer." However, it is established that an employee who is injured "while serving his employer," may not be "acting within the scope of the employment" when the injury is sustained. Under the former circumstance, the employe is entitled to compensation *only* when the act resulting in the injury is intended to benefit the employer; but the employee always is entitled to compensation for an injury sustained, *as a result of the negligence* of his employer, while working within the scope of the employment.

The law is well settled that an injury arises out of an employment, for which the employee is entitled to compensation, *when it occurs in the course of the employment and is the result of a risk involved in the employment or incident to it.*

The injury is thus a natural or necessary consequence or incident of the employment, or of the conditions under which it is carried on. Sometimes the employment will be found to directly cause the injury, but more often it arises out of the conditions incident to the employment.

However, in every case there must be apparent some casual connection between the injury and the employment, or the conditions under which it is required to be performed, before the injury can be found to arise out of the employment for which the employer is liable.

Sometimes litigation arises when an employee is injured while attending to personal duties or necessities such as eating lunch, getting a drink of water, attending to bodily necessities; or the injury is sustained while the employee is coming to or going from work, during rest period, or at other times when the employee is not actually rendering a service for his employer, but is performing acts incidental to the employment.

Generally speaking, the employee is entitled to compensation under the compensation laws for an injury arising "in the course of the employment" if the accident occurs while the employee is doing what he may reasonably be expected to do at a place where he may have good reason to be during that time. Moreover, an injury arises "out of" the employment when the risk resulting in the injury may have been contemplated by a reasonably prudent employer.

For example, in the recent case of Schockley v. Morristown Co., 11 S. W. (2d) 900, the Court explained the law on this subject, as follows:

"An employee, while at work for his employer, may do those things which are necessary to his own health and comfort, even though they are personal to himself, and such acts will be considered incidental to his employment. And while recognizing, as we do, the general rule that an employee cannot be awarded compensation when he has turned aside from his employment for his own purposes, there are many departures by an employee which do not deprive him of compensation; for examples, in seeking toilet facilities, in preparing for the street, in quenching his thirst, in eating a lunch, in seeking fresh air, in seeking shelter from a storm, in protecting himself from cold, or even in saving his personal belongings from injury."

Sometimes, the Courts have considerable difficulty in determining whether an employee is entitled to compensation, under the Workmen's Compensation Laws, when he is injured while attending to his regular duties, but under circumstances *not* connected with the employment. For instance, in the leading case of Carmichael v. J. C. Mahan Co., 11 S. W. (2d) 672, decided during the past few weeks, an employee, who was attending to his regular work, was shot in the eye by a boy who was playing with an air rifle.

The lower Court held the employee not entitled to recover compensation, but the higher Court reversed this verdict and in holding the employer liable, said:

"It is said an injury arises out of the employment when there is apparent to the rational mind, upon consideration of all the circumstances, a casual connection between the conditions under which the work is required to be performed and the resulting injury. . . . The employee, while at his post of duty, going about his employer's business, was struck by a missile from an air rifle in the hands of children, guests of the employer, who were impliedly invited to the premises and permitted to remain there."

### Cannot Waive Workmen's Compensation Laws

It is well to know that, in the majority of states, employers are not permitted to settle a claim for injuries, unless the terms of the settlement conform with the provisions of the Workmen's Compensation Laws.

For illustration, in Comingore v. Shenandoah Co., 226 N. W. 124, it was disclosed that the dependents of a deceased workman, who was killed while performing his regular duties, compromised with the company for $4,500. This settlement was approved by the Industrial Commission. However, in view of the fact that this amount was less than that specified in the compensation laws, the higher Court held the agreement void, stating the following important law:

"In law, no contract, rule, regulation, or device whatsoever shall operate to relieve the employer from any liability created by the Workmen's Compensation Act. . . . The Industrial Commissioner has power to approve an agreement only when the terms of such agreement conformed to the provisions of the act."

### Fraudulent Settlement Is Void

Irrespective of the testimony of the employee with whom settlement for injuries is made, such settlement always is invalid, if the employee was fraudulently induced to sign the agreement. This point of the law was discussed in the recent case of Hornstein v. Alpha Co., 18 S. W. (2d) 121.

Here it was disclosed that a workman signed an agreement by the terms of which he released his employer from payment for injuries. Later the employee sued to cancel the release on the grounds that he could not read and that before he signed the paper he was informed that it was merely a receipt for his wages. In view of this testimony the higher Court held the settlement void, stating the following important law:

"It is manifest . . . that plaintiff (employee) was influenced in executing the release by fraud and deceit in procuring his signature, or by fraud in misrepresenting to plaintiff the nature and extent of his injuries."

### When Employee May Sue for Damages

Frequently, injured employees prefer to sue for damages under the common law, rather than accept the amount of compensation fixed by the Workmen's Compensation Laws. This circumstance may exist where the injury resulted from *negligence* on the part of the employer, and the employee believes that a jury will allow a verdict for damages for an amount greater than the compensation authorized by the compensation laws.

Generally speaking, an employee who elects to file suit under the common law is barred from relying upon the Workman's Compensation Laws to obtain payment, should the suit terminate adversely for him, and vice versa.

For example, in Soria v. Cowell Portland Cement Co., 277 Pac. 1061, it was disclosed that an employer supplied unfastened covers which lifted from the containers when there was too much cement in the conveyor, thus permitting the revolving screw to remain unguarded until the cover was replaced. An employee, in attempting to replace a cover, was seriously injured when his leg came in contact with the unguarded screw. He sued to recover damages, alleging negligence of his employer instead of agreeing to accept the amount of compensation specified by the Workmen's Compensation Laws. The lower Court held the employer liable and the higher Court upheld the verdict, saying:

"The employee is merely acting under . . . his common-law right of an action for damages for personal injuries in lieu of compensation under the act when the employer, by his failure to insure, has not accepted the compensation features of the act. Certainly, if the state had no Compensation Act, but merely a penal statute making it a misdemeanor for an employer to fail to provide a safe place of employment, such statute, or a prosecution under it, could not affect the right of the employee to sue for

damages for injuries resulting from the employer's negligence."

#### Employee Must Accept Medical Services

Still another important phase of the established law is that an injured employee may not recover full compensation for an injury which can be cured or improved by medical treatment. For illustration, in Sheldon v. Gopher Co., 219 N. W. 867, it was disclosed that a State Workmen's Compensation Act provides definite payments for different injuries. An employee endeavored to recover compensation based upon total loss of his arm, contending that he could not use the portion which was not cut off. However, in view of testimony given by doctors that a very simple operation will cure the trouble, the Court refused to grant full compensation.

## Contractor Makes Valid Assignment of Money Due on Public Contract

Generally speaking, a contractor may make a valid assignment of money due, and others to whom he owes money cannot prevent payment of the money in accordance with the assignment, unless a stop order is *before* the money is due the contractor.

For instance, in Los Angeles City School v. Tucker, 278 Pac. 507, it was disclosed that a contractor entered into a contract with the Los Angeles city school district for the alteration and repair of a school building. It was agreed that full payment should be made to the contractor 35 days after completion of the contract.

The contractor finished the job on April 30th, and at this time was due $574.50. He owed a lumber company and also a rock company for rock. On May 20, the contractor wrote a letter to the Board of Education instructing it to pay the $574.50 to the lumber company. On June 8, three days after expiration of the 35-day limit, the rock company filed a stop notice against payment by the school board of the $574.50 to the lumber company. The rock company also argued that a contractor cannot legally assign money due on a public contract, particularly where he owes other materialmen. However, the court held the assignment valid, saying:

"No precise form of words or writing is necessary to the establishment of an equitable assignment. If, from the entire transaction, it clearly appears that it was the intention of Lewis Tucker (contractor) and Patten Company when the letter or order of May 20 was given, to pass title to the $574.50 in the hands of the board of education to Patten Company, then an assignment will be held to have taken place. . . . If Noyes Rock & Tile Company had filed its stop notice before the 35 days expired under the contract, then it would have had the right to satisfy its claim out of the funds in the hands of the board of education before the assignment to Patten Company would be effective, but said stop notice being filed after the 35 days expired, and after the final payment matured and was payable, such claim is subordinate to and subject to said assignment."

## Lease Held Inheritable

The recent case of Hardsocg v. Grooms, 216 N. W. 78, clears an important point of the law usually uncertain in the minds of the majority of persons who lease property.

The facts of this case are that the owner of property leased the rights of non-metallic products to a person named Grooms. The contract contained the following provision:

"Should Grooms make substantial investment in equipment and machinery installed on the property, he shall, upon notice, have the right to extend the lease for 15 years upon the same terms."

Soon afterward Grooms died and his heirs sought to carry on the work under the lease. The owner of the property contended that he sold the lease exclusively to the deceased and that upon his death it automatically terminated.

However, since Grooms *had purchased equipment* to extract products from the leased property, the Court held the heirs entitled to inherit the full benefits of the lease, and said:

"Where it does not appear that personality is an essential consideration and the object may be attained by one person as well as another, the contract is assignable and survives. In the contract before us the lessor made no provision forbidding the assignment."

## When Corporation Is Liable for Obligations to Promoters

In Dealers' Granite Corporation v. Faubion, 18 S. W. (2d) 737, it was disclosed that a man named Faubion agreed to sell his quarry leases and machinery to a man named Welhausen for $5,000. It, also, was agreed that Faubion should receive an additional $7,500 if Welhausen should organize a corporation to operate the business. The corporation was organized and, after Welhausen was elected president, he gave notes to Faubion for the promised $7,500. Certain stockholders contested the validity of the notes on the grounds that a corporation is not liable for debts created by its promoter.

However, it is interesting to observe that the Court held the corporation liable for payment of the notes, saying:

"The general proposition that promoters of a corporation are not its agents, and their contracts in its behalf are not binding upon the corporation when formed, is well settled. . . . But a contract for the benefit of a corporation, adopted or ratified by it after its formation and such benefits accepted, is binding upon, and becomes the obligation of, the corporation. That was what occurred in this case. The contract between Welhausen and Faubion *contemplated* the formation of the corporation, and specified the obligations of each signer, together with certain obligations to be imposed upon the corporation."

## Proposed Revision of Description of Limestone

Southwestern Freight Bureau Docket 18384 relates to description covering rates on limestone between points in the southeast and points in Arkansas, Missouri, etc. It is proposed to amend the descriptions covering all rates on phosphate rock applying between points in the southeast and points in Arkansas, Kansas, Missouri, etc., to specifically indicate that such descriptions include phosphatic limestone. For example, the description applying generally in connection with rates published in L. & N. R. R. Tariff G. F. O. 44C, are to be amended to read:

"Phosphate rock, crude lump, or phosphate rock, crude ground (including phosphatic limestone), in bulk or in bags, carloads."

There is no question as to the propriety of the application of phosphate rock rates on phosphatic limestone. It is merely for commercial reasons that the shippers are urging the use of the term "phosphate limestone," it being their desire to be able to describe this article in the bills of lading as phosphatic limestone because of a strong prejudice among the feed manufacturers to the use of the term "phosphate rock."

## New Ready Mix Company

Ready Mix Concrete, Limited, has been granted a provincial charter with authorized capital of $200,000. The head office and plant of the company will be located in Montreal, Quebec.

# TRAFFIC NEWS AND COMMENT

## Fuller's Earth

Interstate Commerce Commission Docket No. 20133, reported in 157 Illinois 322, deals with rates on fuller's earth carloads from Quincy, Midway and Jamieson, Fla., to Fort Worth, Tex., Boynton, Muskogee, Okmulgee and Ponca City, Okla., and Coffeyville, Kans.

The per ton rates attacked by the complainant were found unreasonable, and reasonable per ton rates prescribed for the future as follows:

| To— | Rate Attacked | Rate Prescribed |
|---|---|---|
| Coffeyville | $11.63 | $8.60 |
| Boynton | 11.65 | 8.40 |
| Muskogee | 11.65 | 8.40 |
| Fort Worth | 11.05 | 8.00 |
| Ponca City | 11.65 | 8.60 |
| Okmulgee | 11.65 | 8.40 |

Fuller's earth is a variety of clay possessing bleaching properties and used by the complainant here to decolorize petroleum products.

## Sea Sand

In Docket No. 21618, reported in 157 Illinois 59, the Interstate Commerce Commission found the sixth class rate of 28½c per 100 pounds on sea sand and fire sand, Provincetown, Mass., to Rochester, N. Y., unreasonable.

The commodity was described in bill of lading as sea sand and invoiced as silica sand. It is said that sand shipped from Provincetown is the natural sea sand washed upon the shores of Cape Cod and contains 93.86 per cent silica. It is first used as core sand in the making of cores for molding. It is then reclaimed and with the addition of a bond or binder is used as molding sand.

The Commission found that a reasonable rate was not to exceed 19c per 100 pounds.

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## Formal Complaints Filed With Interstate Commerce Commission

No. 22779—Richmond Mica Corpn. vs. A. C. L. R. R. et al. Ask for cease and desist order, the establishment of just and reasonable rates on ground mica, carloads and less than carloads, Richmond, Va., to Norfolk and Newport News, Va., for export.

No. 22780—Lehigh Portland Cement Co. vs. C., R. I. & P. Ry. et al. Ask for cease and desist order, the establishment of reasonable and just rates and relationship as between intrastate rates from Rapid City, S. D., on the one hand and interstate rates from Mason City, Ia., on the other to destinations in South Dakota.

No. 22783—Allied Contractors, Inc., vs. C. & N. W. Ry. Against alleged unreasonable charges on quartzite from points in Minnesota to Gordon, Neb. Ask for reparation and waiver of under charges.

## Silica Sand

Southwestern Freight Bureau Docket No. 18586 proposes the establishment of rates on silica sand carloads, minimum weight 80,000 pounds, or if marked capacity of car is less than 80,000 pounds the marked capacity will govern.

The rates proposed are for application between points in Arkansas and points in Oklahoma and Texas, between points in Louisiana and Texas, between points in Missouri and points in Kansas, Oklahoma and Texas, between points in Oklahoma and points in Kansas, Oklahoma, Arkansas, Louisiana and Texas.

The scale proposed is the same as now published in Item 445 of J. E. Johanson's Tariff No. 114-D, which are the result of the Interstate Commerce Commission's order in Docket No. 9702.

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## Slag

(Granulated, Lump or Pulverized)

Southern Freight Association Docket No. 47506 contains proposal to establish commodity rates per ton on slag, granulated, lump or pulverized, carloads, minimum weight 90 per cent of marked capacity of car, except when cars are loaded to their visible capacity, in which case actual weight will govern, from Copperhill, Tenn., to various eastern destinations as follows:

| | |
|---|---|
| Albany, N. Y. | $6.37 |
| Auburn, N. Y. | 6.37 |
| Boundbrook, N. J. | 6.15 |
| Boston, Mass. | 6.84 |
| Charles River, Mass. | 6.84 |
| East Walpole, Mass. | 6.84 |
| Everett, Mass. | 6.84 |
| Genasco, N. J. | 6.15 |
| Hagerstown, Md. | 4.62 |
| Jamaica, N. Y. | 6.37 |
| Jersey City, N. J. | 6.15 |
| Long Island City, N. Y. | 6.37 |
| Manville, N. J. | 6.15 |
| Maurer, N. J. | 6.15 |
| Mills, N. J. | 6.84 |
| Nashua, N. H. | 6.84 |
| New York, N. Y. | 6.37 |
| Philadelphia, Pa. | 5.14 |
| Rowlandsville, Md. | 5.14 |
| Rutherford, N. J. | 6.15 |
| So. Bound Brook, N. J. | 6.15 |
| Waverly, Mass. | 6.84 |
| York, Pa. | 4.62 |

The rates proposed to Boston, New York, Philadelphia and Rutherford are the same as on crushed stone from Whitestone, Ga.

The rates to the other destinations are made the same as to these base points, using relationships authorized in the east bound guide books, except to Bound Brook, Genasco, Jersey City, Manville, Mamer, South Bound Brook and York.

To York the proposed rate is the same as the present rate to Baltimore. To the other points excepted the Rutherford rate is held as maxima.

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## Chert, Sand, Crushed Stone, etc.

Southwestern Lines Docket No. 18537 involves proposal by the carriers to extend the existing basis in Southwestern territory to include southern Missouri and Kansas.

The proposal applies to aggregates other than mentioned above.

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## Eastern Class Rates

In May, 1924, upon petition of both shippers and carriers, the Interstate Commerce Commission instituted a general investigation of class rates in the territory north of the Ohio and Potomac rivers. Even prior to this there was in contemplation an adjustment of these rates in the eastern section but nothing had been accomplished.

The existing class rate structure is always one of concern to the shipping public as it is the yardstick by which many commodity rates are made. It is true that low-grade heavy-loading commodities are accorded rates based also upon value, competition, and other factors, yet it remains that the class rate level cannot be entirely overlooked.

The proceeding referred to (I. C. C. Docket No. 15,879) has been long and drawn-out, as it involves a very large territory and affects a tremendous movement of traffic.

Extended hearings were had and a tentative report of the I. C. C. Examiner written. The proceeding took into account the results of carriers' operations for the years 1923 to 1928 inclusive, and it was contended by the shippers that, if the proposed report were adopted, the carriers' revenue

The proposed adjustment may result in a greater number of classes with the idea that the added lower classes will take care of many articles now moving on commodity rates.

The proceeding is of such importance that shippers are contemplating the filing of a petition asking for the reopening of the case for further considerations, with the view of adding to the record the net operating profits of the carrier for 1929.

# REVIEW OF FOREIGN PRACTICE

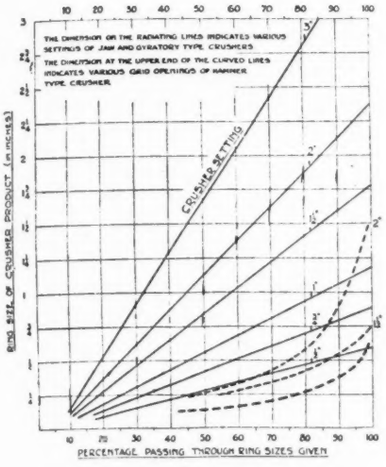

THE DIMENSION ON THE RADIATING LINES INDICATES VARIOUS SETTINGS OF JAW AND GYRATORY TYPE CRUSHERS
THE DIMENSION AT THE UPPER END OF THE CURVED LINES INDICATES VARIOUS GRID OPENINGS OF HAMMER TYPE CRUSHER
CRUSHER SETTING
END SIZE OF CRUSHER PRODUCT (in inches)
PERCENTAGE PASSING THROUGH RING SIZES GIVEN

**Fig. 1. Graph of crushing sizes**

## Gravel or Crushed Stone as Aggregate

The compressive strength of concrete depends upon the kind, the size and the amount of coarse aggregate, whether round, smooth surfaced gravel or crushed stone with sharp angled cubic form and rough surface is used. Gravel gives a concrete with less voids and consequently less sand requirement than crushed stone. The sand content influences the water necessary and consequently concrete made from gravel requires less gauging water. From the standpoint of raw material cost per unit of compressive strength, gravel is to be preferred to crushed stone. With the same sand content, the gauging water is smaller, the larger the coarse aggregate. Concrete mixtures with large aggregate content are more easily workable than with small aggregate. The use of large size coarse aggregate increases the compressive strength by a lessening of the water and sand requirements. The surface character of the coarse aggregate bears an important relationship to the gauging water required, a porous aggregate needing more, a dense one less. Using the maximum possible quantity of gravel and least amount of sand effects an important saving in cement. For gravel, the sand content may be brought as low as 37 per cent for the largest size, for crushed stone as low as 44 per cent. Well selected coarse aggregate increases the economy of concrete, through saving the expensive cement, improves the workability, increases the density, the compressive and bending strengths. K. Pfletschinger (*Zement*, August 22, 1929.)

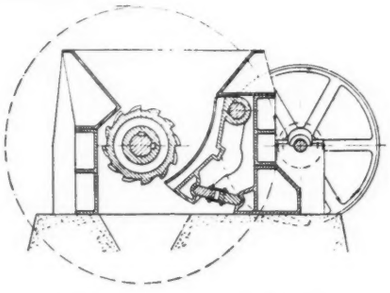


**Fig. 2. Single-roll crusher**

## Jaw, Roll, Gyratory and Disc Type Crushers

The chart shown in Fig. 1 indicates two distinct characteristics of crushing machines. The straight lines show the reduction and usual classification of the product of jaw and gyratory type crushers. The product characteristic of the hamer-type takes the form of a curve. The jaw crusher is the oldest variety and consists of a swinging jaw or jaws which move toward and away from a fixed jaw. This crusher functions about 50 per cent of its running time. It is very suitable for dealing with hard, dry, crystalline and non-clogging material. It is not suitable for gypsum or substances of a tough nature. Owing to its relatively large mouth opening the jaw-type crusher is a very useful and suitable machine for the initial breaking down of large pieces of stone or rock. The gyratory machine is of more modern type and construction. It functions 100 per cent of its running time. It is larger, more costly, and less suitable as a breaking down machine than the jaw crusher. It is suitable for the

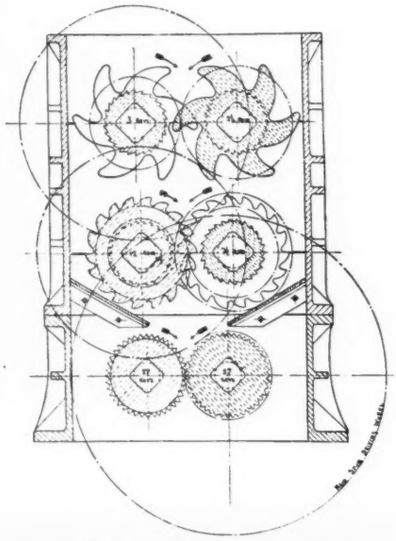


**Fig. 3. Six-roll crusher**

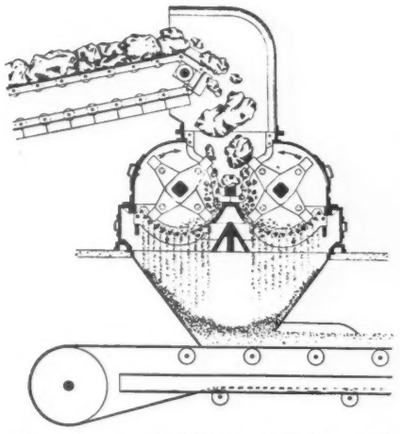


**Fig. 4. Double-spindle hammer type crusher**

materials already mentioned and is much more suitable for gypsum than the jaw-crusher. When used for gypsum the crushing surface should be of semi-circular or corrugated section instead of the more usual vee section. Roll crushers are constructed in several types—single roll, double roll, smooth surface and corrugated surface, high speed roll and slow speed gear-driven rolls, etc. The single-roll slow speed, gear-driven machine (Fig. 2) is being adopted largely in the United States for breaking down limestone and similar raw material. A recent machine of this type has a capacity of 350 to 400 tons per hour. The feed may be as large as a 3 ft. cube and the discharge a 6 in. cube or even less. Such a machine requires a 400 to 450 B. H. P. motor to drive it. Crushing is effected by the toothed, serrated or corrugated surface of the slow-speed roll feeding and crushing the material against a fixed jaw incorporated in the machine framing. Double roll, slow speed crushers are used for dealing with coal used in rotary kilns, and crushing in this case is effected with the object of producing a feed suitable for the coal grinding mills. Fig. 3 shows such a machine, built up of three pairs of roll shafts, each being fitted with tooth type discs to form the roll. The power required for a unit of this kind is relatively small, about 1¼ or 1½ B. H. P. per ton. Hammer-type crushers are made with either a single or double spindle. Single-spindle machines are used generally in Great Britain, the double-spindle types being universally used in continental Europe and the United States. The reduction ratio of the double-spindle type is almost unlimited. These machines will accept as feed whatever size pieces

will enter the mouth of the machine and discharge a product of pre-determined maximum size. Double-spindle machines are used for reducing limestone from quarried sizes, say, 36 in. by 24 in. by 12 in. down to about 1 in. or 1¼ in. ring size suitable for feed for a dryer or for the raw grinding mills. Fig. 4 shows a section through a double-spindle hammer-type crusher. The disc crusher (Fig. 5) is made in horizontal type in England and vertical type in the United States. It functions 100 per cent of its running time. Its reduction ratio is comparatively small, 3½ or 3 to 1. This machine definitely produces gravel and not fines and is suitable for this purpose. Crushing is effected by a heavy compressive pressure exerted by and between two smooth, dished or concave surfaces.

These four types of crushers, jaw, roll, gyratory and disc machines reduce the input to the general size determined by the initial setting of the machine. The hammer type produces a large amount of fines. The tendency of this machine is to reduce the size of every piece of material which passes through it, but the maximum size may be predetermined.—Anon. (*Cement and Cement Manufacture* (London), Vol. II, No. 5, pp. 137-144, 1929.)

## Filters for De-Watering Slurry

In view of the economy in kiln fuel with the dry process of manufacture, the use of filters for de-watering wet slurry has always appeared attractive. Even if the water in the slurry is as low as 35 per cent, a dry slip of 7½ per cent moisture content represents an economy of 0.7 ton of water to be evaporated. The filtration process is applicable only to certain types of raw materials. Only continuous, automatic filters may be used, the "leaf" type vacuum filter being preferable. This type consists of a series of thin circular compartments, the filtering surface forming the sides of the disc. The whole series is supported on a horizontal spindle, which is slowly rotated. As the upper edge of a rotating leaf covered with filter cloth passes below the surface of the slurry contained in the tank, full vacuum is applied to the submerged sector, forming a uniform and homogeneous cake on both sides as the filtrate is sucked through the filter cloth. This cake is then washed by sprays, being held in place by the vacuum, dried by the same means, and as the discharge knives reach the cake, the vacuum is reduced on the sector, releasing the cake, which is conveyed by a moving belt. This process has not yet been

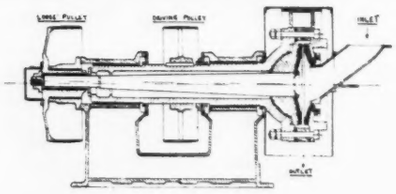


Fig. 5. Disc crusher

adopted on a commercial scale, but shows promise of considerable economy in cases where the wet slip is easily filtrable. A. C. Davis (*Cement & Cement Manufacture*, August, 1929).

## Effect of Storage on Cements

The stability of "super" cements and ordinary portlands on storage were compared. Both varieties were stored and tested after 2, 4, 9 and 18 months for strength, setting behavior, fineness, density and loss on ignition. The loss of strength of the super cements on storage was found to be relatively less than the portlands, but the former have a greater tendency to clump together. The initial strengths in all cases were more strongly affected than the strengths at 28 days, and the compressive more than the tensile resistance. The super cements, after two months storage, showed an appreciable difference in compressive strength from that in fresh condition, and after 4 months the 3-day strength dropped 8 per cent, after 9 months 21 per cent. The setting time of all cements is much increased by storage for 9 months, requiring more than 10 hours. The density did not alter much by storage, and the loss on ignition increased appreciably. It is concluded that the properties of super cements are no more unfavorably affected by storage than those of ordinary portlands. As the setting time increases regularly with storage up to 9 months, this property can be used to determine roughly how long a cement has been in storage. Haegermann (*Zement*, August 22, 1929).

## Slag, Coke Breeze and Clinker as Aggregates

Slag will make a sound and strong concrete provided that it is neither very acid or basic. A stronger product results from the use of coarse slag and sand, rejecting the slag fines, as these may be chemically active. Coke breeze concrete is usually rather weak and is unsuited for use in outside or wet locations, but it has the important advantage of yielding a light product which can be used for internal walls. Combined with sand, coke breeze makes a satisfactory fine aggregate. Clinker gives a denser concrete than breeze and of greater strength. But the possible sources of trouble with this material are rather great owing to its lack of uniformity. Unburnt coal is likely to be a source of danger. Clinker in association with lime forms a very serviceable aggregate for mortar and plaster, and its pozzolanic properties render it superior to sand. A concrete can be made from slag with a strength as high as that of gravel concrete and often higher. F. M. Lea & F. L. Brady (Dept. of Sci. & Ind. Res. Bldg. Res. Report No. 10, London.)

## Deaerated Concrete

Deaerated concrete is an invention, protected by patent, for mixing concrete in a vacuum, with the object of improving the quality as regards both strength and density.

During the last few years the whole of the improvement that has been made in the manufacture of concrete has been due to the improvement in the cement, although it is possible that more care is taken now in selecting the aggregate and sand used. As the quality of the cement has improved, the strength of concrete obtained under working conditions has dropped further and further behind that which can be obtained in test results under laboratory conditions. So much is this the case that many practical users of concrete have come to regard laboratory tests as being of little value as a guide in practical working, except for the purpose of testing the quality of the cement.

Deaerating concrete is a practical method of insuring that the whole of the conditions obtainable by the use of modern cements in the laboratory can be reproduced in bulk under actual working conditions. The process does automatically and thoroughly what the laboratory gauger and the conscientious workman endeavors to do—that is to consolidate the concrete. It is a fool-proof and labor-saving method of making the strongest possible concrete.—Anon. *The Structural Engineer*, London, Oct., 1929.

## Gypsum Cement

Gypsum rich in $Al_2O_3$ is used instead of bauxite in the manufacture of fusible cements, $SO_2$ being obtained as a by-product. Thus, the gypsum may be heated with bituminous shale, clay or bog iron ore, or a baryta cement may be obtained by heating the gypsum with residues from the manufacture of BaS, if necessary with addition of Al silicate and sand. Otto F. Honus (German Patent 477,212, C. A.).

# LATEST NEWS FLASHES

## Portland Cement Mill To Be Established in Ancient City of Damascus

We are in receipt of a letter from Chiek Sadi Ketabi of Damascus, Syria, explaining the plans of a company, of which he is vice-president, for erecting, in his city, a modern portland cement factory.

الشركة الوطنية لصنع الشمينتو ومواد البناء
العنوان التلغرافي
ياسين دياب — دمشق
جميع المخابرات تكون باسم رئيس الشركة
عطا بك الايوبي
دمشق — سوريا

This new company bears the French title, Societe Nationale du Ciment et des Materiaux de Construction and was organized last February with a capitalization of about $450,000. Other officers are: Atta bey Ayoubi, president; Yassin Eff. Diab, treasurer; Joseph Dabbouss, secretary; Faris bey Khoury, judicial adviser; and Chukry bey Kalipha, technical director.

Should any of our readers desire more information, we offer a portion of the letter for their perusal.

## One California Town Fosters Cement Manufacture

There has been so much opposition to cement companies expressed by cities in California during the past year that the following news item seems almost incredible. The Torrance *Herald* states that the voters of Torrance approved unanimously the annexation by the Paramount Portland Cement Company of approximately six additional acres, and that the company will start the erection of a $2,800,000 plant as soon as titles are secured.

## Chain Belt Company Opens New Boston Office

The Chain Belt Company, Milwaukee, has opened a New England district office in Boston at 950 Park Square Building. This makes the eighteenth district office the company has opened in the United States within a comparatively few years. J. K. Merwin, district manager, is a Yale University graduate of 1924. He formerly worked at the Chain Belt Company's Milwaukee and West Milwaukee plants and later went to Cleveland with the company's subsidiary, the Stearns Conveyor Company. The Boston office will manage the distribution of the company's entire line of conveying systems, power plant equipment, chains and transmission machinery.

## Employees Receive Back Pay

Employees of the Indianapolis Stone Company, employed in the mill and quarry of the company at Stinesville, received $14,000 in back pay from the company recently through the receiver, A. R. Marley, of Gosport, Ind.

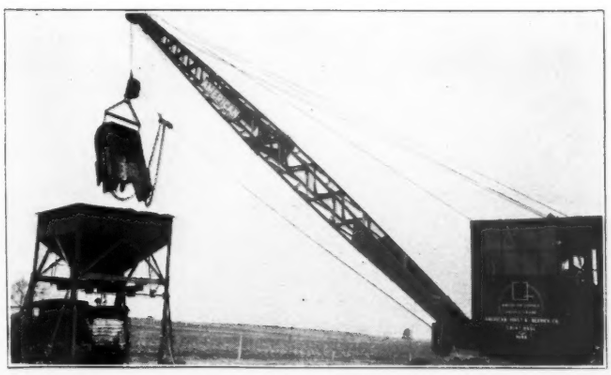
The company was thrown into the hands of a receiver late in the summer through suits of 77 employees who had not been receiving their pay regularly. The suits were filed in the Monroe county courts. Marley was appointed receiver by the court at that time.

F. M. Cassaday is to reopen an old quarry owned by the Mountain Quarry Company about ten miles southwest of Llano, Texas. Equipment is being assembled.

## Thousand Yards of Gravel Loaded in Ten Hours

Near Alta, Iowa, A. L. Albrecht, of Storm Lake, operates a shovelcrane, equipped with a 1-cu. yd. dragline bucket, to dig and load gravel. On a recent day he used nine 2½-cu. yd. motor trucks and hauled the gravel a maximum distance of 1½ miles. With this equipment he handled between 960 and 1,000 cu. yd. in ten hours. In 55 hours, he moved more than 4,000 cu. yd. During two of the days considered there was a shortage of trucks so that the digging and loading equipment stood idle approximately one-third of the time. In addition, however, to the above yardage actually loaded into trucks, the crane stripped about 200 cu. yd.

The daily consumption of gasoline was around 40 to 45 gallons. The gasoline consumed during this stripping and the loading of the 4,000 cu. yd. was about 215 gallons.



Small gravel plant operated by A. L. Albrecht

## Addition to West Winfield Cement Plant

The MacDonald-Spencer Engineering Company of New York and Chicago has about 100 men at work at West Winfield, Pa., erecting additions to the plant of the West Penn Cement Company that will double the present capacity of the plant. The estimated cost of the improvements is $160,000.

The West Winfield plant was erected and placed in operation about three years ago. The company owns patents on four ingredients which enter into its product, which has met with great success in competition with similar products.

A modern lighting system permits operation of the plant at night, the whole area being lighted almost as well as daylight. Present production is about 1,400,000 barrels of cement annually. Operations will be pushed in order to secure large stocks when the construction season opens next spring.

## Westinghouse Salutes Industry by Radio

The Westinghouse Electric and Manufacturing Company is inaugurating a good-will series of radio programs dedicated to industry. Each week at 6:30 o'clock (central standard time) on Wednesday nights, on a coast-to-coast chain of broadcasting stations, with supplementary networks, a half-hour will be devoted to one individual industry. Something of the history, the romance and the progress of that industry will be extolled in a dramatic entertainment with a musical background. The industries to be covered are, in succession, beginning November 6, iron and steel, aviation, paper, food, and textile.

## General Refractories Appoints Maryland Representatives

General Refractories Company has appointed the Desch Supply and Equipment Company, of 16 South Frederick Street, Baltimore, Md., as its representative in the state of Maryland to cover this state east of Alleghany County and west and north of Chesapeake Bay. This territory includes Washington, D. C.

The products which the Desch company will handle are GREFCO chrome high-temperature cement and STANDARD silica-bonding cement. Users of such cements in this territory will now be able to obtain prompt and efficient service at all times.

## Idaho Phosphate Mill

The Keystone Phosphate Company in Bear Lake County, Ida., will soon begin grinding in its 500-ton mill. An aerial tramway is to be erected to connect with the Oregon Short Line railroad.

## Mississippi to Have New Cement Plant

H. J. Harris of Dallas, Texas, is president and general manager of the National Portland Cement Company which has been exceptionally active the past year in the erection of new plants. A new grinding and finishing plant has been completed at Houston, Texas, and a plant for producing white cement is practically completed at Chubbuck, Calif.

A. J. Kutner, assistant general manager of the National Portland Cement Company, states that the company has acquired quarries on Mississippi river at Vicksburg, Miss., and a subsidiary company has been incorporated as National Portland Cement Company of Mississippi, with capital stock of 150,000 shares no par value, with following officers: H. J. Harris, president and general manager; C. S. Atkinson, secretary-treasurer; A. J. Kutner, assistant general manager; and E. R. Horton, traffic manager, all of Dallas, Texas; and J. W. Finger, vice-president, Houston, Texas. Proposed plant will cost in the neighborhood of $2,250,000.

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The Keyport Stone and Lime Company, a subsidiary of the France Limestone Company, is to operate a quarry five miles east of Logansport, Ind. Its articles of incorporation will enable it to prepare and market crushed stone and lime and to construct roads.

Structural Gypsum Corporation, Linden, N. J., has expansion plans under consideration for its Akron, N. Y., plant. J. R. Haskins is special engineer of the company.

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The Premier Granite Company of Llano, Texas, is putting in a large shed and crane with full facilities for a cutting plant.

## Fuller-Lehigh Moves Office

The New York office of the Fuller-Lehigh Company has been removed from 50 Church Street to 85 Liberty Street.

# MANUFACTURERS' PUBLICATIONS

*Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention* PIT AND QUARRY *when making such requests.*

**Castings, Ferrous**

"Properties Required in A. S. T. M. Specifications for Ferrous Castings." 4 p. (*Research Group News*, Oct., 1929, Electric Steel Founders' Research Group, Chicago.) Gives the American Society of Testing Materials' specifications for various kinds of ferrous castings.

**Cement, Waterproof**

*Waterproof and Wearproof for Permanence.* 8 p. (Advance waterproof Cement Co., Chicago) Describes reground Portland cement and Hydro-Corundum Portland cement and their uses.

**Cranes**

*Crane Service News*, Oct.-Nov., 1929. 4 p., 25 ill. (Universal Crane Co., Cleveland, Ohio) Describes and illustrates various uses of crawler and truck-mounted cranes.

**Digging**

"Digging Aggregates for Isolated Concrete Road Job." 7 p., 3 ill. (*Sauerman News*, Oct., 1929, Sauerman Bros., Inc., Chicago) Describes the operations of a contractor in preparing aggregates for a road-building job.

**Dryers**

*"Elmore Continuous Centrifugals Have Reduced the Cost of Deliquefying Solid Materials to a Lower Point than Ever Before."* 4 p. 3 ill. (Elmore Centrifugal Products Corp., St. Louis, Mo.) Describes the mechanical principles of the machines and illustrates their construction and various applications.

**Pit and Quarry Machinery**

*Telsmith Mining, Quarry and Gravel-Pit Machinery.* 28 p., 38 ill. (Smith Engineering Works, Milwaukee, Wis.) Describes and illustrates various types of machinery for use in pits and quarries: Breakers, jaw and reduction crushers, screens, washers and rewashers, sand banks, vibrators, belt elevators, belt conveyors, bar and rotary grizzlies, feeders, and bin gates.

**Pipe Welding**

*Design Standards for Oxwelded Steel and Wrought-Iron Pipe.* 68 p., 78 ill. (Linde Air Products Co., New York, N. Y.) Describes and illustrates designs for welding line joints, pipe flanges, tee and branch connections, bends (fabricated and notched), swages, bull plugs, anchors and headers. The appendix gives valuable pipe data.

**Steam-Generating Equipment**

*Fuel-Burning and Steam-Generating Equipment.* 16 p., 50 ill. (Catalogue GC-5, Combustion Engineering Corp., New York City.) Describes and illustrates various types of coal pulverizers, pulverized-fuel furnaces, air preheaters, underfeed and grate stokers, combustion steam generators, and boilers.

**Steel**

*Products and Publications of the Subsidiary Manufacturing Companies of the United States Steel Corporation.* 52 p. (United States Steel Co., New York, N. Y.) Lists the offices, products and publications of the sixteen companies owned by the steel corporation.

**Stripping**

"Where the Overburden Is Solid Rock." 3 p., 5 ill. (*The Earth Mover*, Nov., 1929, Western Wheeled Scraper Co., Aurora, Ill.) Describes the methods of a large Pennsylvania stripping contractor.

**Track Construction and Maintenance**

*Nordberg Patented Track Machine.* 12 p., 49 ill. (Nordberg Mfg. Co., Milwaukee, Wis.) Describes various uses of the track machine in pits and quarries for shifting, raising, ballasting, elevating, and laying railroad track.

*The Nordberg Power Jack.* 8 p., 21 ill. (Nordberg Mfg. Co., Milwaukee, Wisconsin) Describes and illustrates a track-ballasting machine and a power-driven adzing machine.

**Work**

*What Is Labor?* 12 p., 1 ill. (Experience, No. 12, Sturtevant Engineers, Boston, Mass.) A discussion of machinery and human labor and their relative values in the search for maximum profit.

# NEW MACHINERY AND SUPPLIES

Track machine

## Machine That Raises, Grades and Shifts Track

The use of the Nordberg Track Machine has spread to every application where hand methods were formerly used for shifting and raising track. Its performance, as a saver of time and labor expense, has convinced even the most skeptical that hand labor cannot compete with this unusual machine. This machine consists of a welded steel-framed car, powered by a 40-hp. fully enclosed gasoline motor, together with the necessary drives and controls for operating the lifting spud and for traveling.

Compared with hand shifting, the track machine will accomplish as much as 80 men with bars. It will not kink the rails nor injure the joints. It will work in soft footing and in places where it would almost be impossible to work by hand. Having a lifting capacity of 50,000 lb., it will lift and shift track that is deeply embedded or frozen in. At each shift a lateral movement of 18 to 36 in. can be secured, depending upon the condition of the track and the material under the track.

Around quarries, pits, or waste dumps, the machine soon pays for itself out of labor savings. Its use does not take men from their other jobs on overtime or Sundays.

By adding the leveling device to the standard machine, it is a simple matter to adapt the machine for track-raising work. When so arranged, the machine will lift both rails together, or one higher than the other, as in banking a curve, and hold the track indefinitely in the raised position. Clamp levers control the vertical movement of these lifting spuds, permitting a close regulation of lift.

With this device a lift of three feet can be secured, allowing access for working on the rail bed, or for removing ties without the interference of jacks. When used for raising work, not only does the machine displace the jack gang, but also men required for the digging of jack-holes and setting of jack-blocks. Another feature of the machine is that its use is not hindered by mud, sand, cinders, slag and other soft materials, which make the use of jacks a difficult task. Due to its great lifting capacity, the machine is especially suitable on heavy-duty raising.

## Veteran Producer Perfects New Truck Mixer

Stephen Stepanian, vice president and general manager of the Arrow Sand and Gravel Company, of Columbus, Ohio, and well known by his fellow operators, especially those who attend the annual conventions of the National Sand and Gravel Association, has developed a new type of truck mixer. This machine, although primarily a truck mixer, can be used for transporting premix concrete, ready-mixed mortar, sand and gravel and crushed stone and can also mix building mortar.

This machine is the result of several years' effort on the part of Mr. Stepanian, whose experience eminently fitted him for this task. He has the distinction of being not only the inventor and maker of this mixer but of being a producer of sand and gravel and concrete as well. He has been in the sand and gravel business since 1907. He just started experimenting with truck mixed concrete in 1915, long before most operators had even heard of it, and has been devoting a good share of his time to it since.

The mixer consists of a drum with a short cylindrical center section and frustrum ends supported on a framework of structural steel shapes. The design of the mixer is such that no heavy cumbersome structure is required. The mixing blades are self-cleaning and give an unusually rapid and thorough mix because of the figure eight mixing motion. The drum is water, air and steam tight, the latter being an advantage when hauling hot concrete for winter construction. The water tank, which is easily connected or detached, does not add any extra height to the unit and the water is applied by gravity at both ends of the cone at a point above the mass in the mixer. This not only insures a rapid and uniform mix but a free flow of water as well. The mixer fits any standard truck, all structure of the unit being above the chassis frame, and the entire unit is attached to the chassis by four bolts.

The mixer is loaded at the top direct from the bin gates through a specially designed rack and pinion gate with roller bearings. This is 12 in. wide and 34 in. long, allowing rapid loading or discharge and rendering the interior of the drum easily accessible for cleaning, inspection or repair. The open top loading eliminates any necessity of premixing of aggregates by means of special loading equipment and the drum does not revolve as the mixer is being charged.

To unload the drum is turned until the gate is at the bottom. The material discharges onto an 8-ft. belt conveyor with a capacity of 2 cu. yd. per min. and adjustable to discharge at different heights up to 7 ft. A swinging chute at the end of the conveyor allows the concrete to be deposited within a radius of 7 ft. from this point. This chute folds underneath the conveyor when not in use or when in transit.

No hydraulic hoist is required to dump the contents of the mixer and there are no extra motors. Both agi-

Truck mixer as it looks when in transit. Chute is folded back under conveyor

**Conveyor and chute in position to discharge load. Mixer drum open and in position to show ease of access to interior**

tator and conveyor are driven from the truck power plant by direct, chain, multiple vee belt or gear drive as desired. The drive is mechanically simple and no special clutch is required as the gears are always in mesh. A single lever in the truck cab operates all the mechanism. When pushed one way it operates the mixer, and in the opposite position operates the belt conveyor. Only one can be operated at a time.

The rate of discharge of the concrete can be accurately controlled. The conveyor can be operated when the truck is in motion and its speed can be regulated by speeding up or slowing down the motor. This feature, together with the pivoted discharge chute, makes a flexible combination for all kinds of concrete placing. For curb or sidewalk work, for example, the truck can be moved along and the concrete deposited at any rate desired. The concrete can be made either in transit or at the destination as desired.

The 2½-cu. yd. size is at present the only one being made. This is mounted on a 3½-ton truck chassis and has a total loaded weight of 12 tons. A maximum of 10 hp. is required to operate the mixer and the application of power is uniform, with no high torque as in some types of mixers.

## New Van Dorn-Flex Disc Grinder

The Van Dorn Electric Tool Company of Cleveland, Ohio, has just announced a new 7-in. Flex-Disc Grinder in addition to its present 9-in. grinder, which has proved to be a time-saver over the hand method of smoothing welded and soldered joints and seams, cleaning dies, smoothing metal surfaces before painting, and any other work requiring filing, sanding and emerying.

It has ample power and, with the use of a felt backed abrasive disc, it will handle these operations quickly and satisfactorily.

The improvements made on the 7-in. grinder have been included on the 9-in. grinder, such as refined design, a removable pipe-handle, and right- and left-hand bosses, making it possible to quickly and easily change the grinders for right- or left-hand operation.

## McKiernan-Terry Corporation Change Corporate Name

The McKiernan-Terry Drill Company, of 15 Park Row, New York, on November 1 changed its corporate name to McKiernan-Terry Corporation and acquired ownership of The National Hoisting Engine Company, of Harrison, N. J., and Steele & Condict, Inc., of Jersey City, N. J. The consolidation of these three firms with products going into the same fields has been effected to provide adequately for greater business expansion.

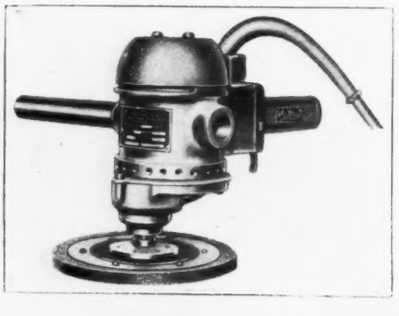
The National Hoisting Engine Company and Steele & Condict, Inc., will preserve their identity to the extent that they will operate and be known as divisions of the McKiernan-Terry Corporation, but with executive activities transferred to the sales offices of the corporation in New York.

The officers of the McKiernan-Terry Corporation are:

Arthur W. Buttenheim, president: Lester H. Buttenheim, vice-president in charge of production; Chas. S. Ackley, vice-president in charge of sales; Wm. F. Campbell, vice-president in charge of National Hoist division; John C. Smaltz, vice-president in charge of Steele & Condict division; Earle R. Evans, vice-president in charge of field operations; Thomas E. Sturtevant, treasurer; Samuel Harper, assistant treasurer; Samuel S. Whitehurst, secretary; J. Forrester Campbell, assistant secretary.

For economic reasons, work previously done at the plant of Steele & Condict, Inc., at Jersey City, will be transferred to, and divided between, the McKiernan-Terry plant at Dover, N. J., and The National Hoisting Engine plant at Harrison, N. J.

Both these latter plants have already been substantially enlarged and further building expansion and increases of tool equipment are pending.



**Flex-disc grinder**

## Cutler-Hammer Moves St. Louis Office

The St. Louis district sales office of Cutler-Hammer, Inc., has moved from 611 Olive Street to 1914 Washington Avenue, St. Louis, Mo. A stock of standard C-H motor control and wiring devices will be carried for immediate delivery in the warehouse located at the same address. These new facilities will enable the company to better serve its trade in the south and midwest, including the states of Kansas, Missouri, Oklahoma, Arkansas, Louisiana, Texas, Southern Illinois, Southern New Mexico and parts of Tennessee, Kentucky and Indiana.

## Wagner Electric Announces Two Changes in Quarters

Wagner Electric Corporation announces the removal of two branch sales offices. The Milwaukee sales office and service station have been moved from 501 Broadway to 525-27 Broadway. The St. Louis sales office has been removed from 505 Shell Building to 909-9 Plaza Olive Building. Those removals were necessitated by increased business requiring more space.

Manistee Sand and Dock Company, Manistee, Mich., has bought Hubbell Sand Company, with plants at Manistee, Ludington, and Frankfort, Mich. A new conveyor system has been installed, and sand will be shipped by boat and by rail.